ENVIRONMENTAL RESOURCES MANAGEMENT

Final Phase I RCRA Facility Investigation Report

Occidental Chemical Corporation
Delaware City, Delaware

Volume I

Revised 4 December 1996

Environmental Resources Management, Inc.
855 Springdale Drive
Exton, Pennsylvania 19341

ERM®

ENVIRONMENTAL RESOURCES MANAGEMENT GROUP

Draft Phase I RCRA Facility Investigation Report

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Delaware City, Delaware

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3 June 1994

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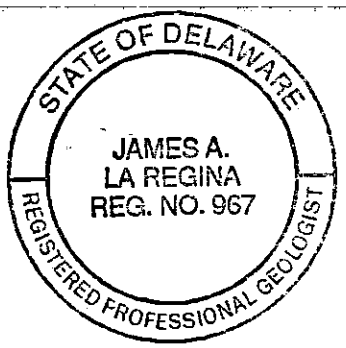

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ERM's Commitment to Quality

Our Quality Policy

We will fully understand the requirements of
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client and supplier relationships.

Paul H. Woodruff, Chairman

Kent E. Patterson, President and C.E.O.

OxyChem®

June 2, 1994

CERTIFIED MAIL

Mr. David Toth (3HW61)
U. S. EPA Region III
841 Chestnut Building
Philadelphia, PA 19107

RE: Draft Phase I RCRA Facility Investigation Report Submittal

Dear Mr. Toth:

Pursuant to the Administrative Order on Consent, OxyChem is submitting four copies of the Draft Phase I RCRA Facility Investigation (RFI) Report. This report summarizes the results and presents the conclusions that can be drawn from the Phase I investigation. The report also contains a proposed scope of work for the Phase II RFI investigation. This scope of work presents the field tasks designed to characterize migration pathways associated with the SWMUs of concern. The SWMUs of concern, the areas proposed for investigation and the investigation methods have been developed based upon the results of the Phase I investigation.

If you have any questions pertaining to this report, please call me at (302) 834-3947.

Sincerely,

Jess A. Vargo

Jess A. Vargo
Sr. Process Engineer

CC: DNREC, Mark Davis
ERM, Jim LaRegina
OxyChem/Niagara, Larry Dirickson/Vern Heble
OxyChem/Delaware City, Wes Sanders/Dick Timmons/David Hunt

Occidental Chemical Corporation
Basic Chemicals Group
River Road, P.O. Box 550
Delaware City, Delaware 19706-0550
302/834-3800

OxyChem®

June 2, 1994

Certified Mail

Mr. David Toth (3HW61)
U. S. EPA Region III
841 Chestnut Building
Philadelphia, PA 19107

RE: Draft Phase I RCRA Facility Investigation Report Submittal
Delaware City Plant RCRA Corrective Action Program

Dear Mr. Toth:

Occidental Chemical Corporation has included four copies of the Draft Phase I RCRA Facility Investigation Report for the RCRA Corrective Action Program at the Delaware City Plant, pursuant to the Final Administrative Order on Consent (AOC) entered into by OxyChem and the Environmental Protection Agency, Region III on June 28, 1991.

I certify that the information contained in or accompanying this letter is true, accurate and complete.

As to those portions of this response for which I cannot personally verify their accuracy, I certify under penalty of law that this letter and all attachments were prepared in accordance with a system designed to assure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate and complete.

I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Sincerely,

K. Wesley Sanders
Plant Manager

CC: OxyChem/Niagara, Larry Dirickson
OxyChem/Niagara, Vern Heble
OxyChem/Delaware City, Dick Timmons/David Hunt
OxyChem/Delaware City, Jess Vargo
ERM, James LaRegina
DNREC, Mark Davis

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Section 1

1.0 INTRODUCTION

This report has been prepared by Occidental Chemical Corporation (OxyChem) and its consultant, Environmental Resources Management, Inc. (ERM) for the RCRA Facility Investigation (RFI) at the OxyChem Delaware City, Delaware Facility (the facility). It presents the results of the Phase I RFI activities at the facility.

Pursuant to a 3008(H) Order, OxyChem entered into an Administrative Order of Consent (AOC) with EPA, dated 1 July 1991, to conduct a Corrective Action Program (CAP) at the facility. This RFI Report comprises component parts, Tasks IV and V of the CAP, which are the Facility Investigation and Investigation Analysis, respectively. The performance of these tasks is based on the Task III, RCRA Facility Investigation Work Plan, which was approved by EPA on 19 August 1993. The approved Work Plan prescribes a 3-phase RFI process. Supplementary information pertaining to this work was provided previously to EPA as the Task I, Description of Current Conditions, and Task II, Pre-Investigation Evaluation of Corrective Measure Technologies.

The facility manufactures inorganic chemicals such as chlorine, hydrogen, sodium hydroxide, and potassium hydroxide from NaCl and KCl salts. The salts are put into solution with water and are electrolytically separated into the desired end products. At one time while under the ownership of Diamond Shamrock, the facility also operated a polyvinyl chloride (PVC) plant, which manufactured homopolymer resins by an emulsion and suspension polymerization process. This PVC plant is located south of the chlorine production area and is currently owned by Keneka Delaware, Inc. (most recently Georgia Gulf).

During development of the current wastewater treatment plant at the facility, and disposal of solid wastes at an off-site facility, OxyChem operated six disposal impoundments to receive liquid and solid wastes from the chlorine and PVC production processes. These units were in operation at various times during the facility's history and are no longer used for disposal purposes. The wastes in these units have been closed in place by installing low permeability caps on each unit.

Numerous investigations and studies have been conducted at the facility to evaluate the effects these former disposal impoundments (now referred to as RCRA Solid Waste Management Units (SWMUs)) have on-site ground water and soil quality, and on the surface water and sediment

quality of Red Lion Creek. Some of these investigations have shown that constituents may have been released from the waste disposal areas and have the potential for off-site migration.

The purpose of the RFI is to assess the SWMUs, including characterization of each SWMU, evaluation of constituent migration pathways, and assessment of potential risks to human health and the environment. This work has been performed in accordance with the guidance in Attachment B of the AOC, Scope of Work for a RCRA Facility Investigation. It is also consistent with EPA's RCRA Facility Investigation Guidance (EPA 530/SW-89-031, May 1989) and 40 CFR Parts 264, 265, 270, and 271, Proposed Rule, Corrective Action for SWMUs at Hazardous Waste Management Facilities (Federal Register Vol. 55, No. 145, 27 July 1990).

1.1 *BACKGROUND INFORMATION*

1.1.1 *Site Description*

The facility is situated on a 300 acre (approximate) tract of land 3.5 miles northwest of Delaware City, Delaware in New Castle County. The facility's processing area occupies approximately 21 acres of the 300 acre property. Red Lion Creek, a tributary of the Delaware River, lies immediately north of the plant. The east side of the property is bounded by the Delaware River. The 100-year flood plain in this area is 10 feet above mean sea level. The flood plain has been protected against tidal fluctuations of the Delaware River by a dike and tidal gate since before plant construction. However, Red Lion Creek may have been tidally affected from 1985 to 1987 when the dike was washed out. The plant process area and all waste management areas are diked and outside of the 100-year flood plain. A site location map is presented in Figure 1-1.

1.1.2 *Land Use*

The facility is located in a heavily industrial area north of the intersection of Delaware Routes 72 and 9 (Clark's Corner Road and River Road). The facility property is adjoined by several other industrial plants to the south and southwest. Keneka Delaware, Inc., which operates the PVC plant is located to the immediate South. Two commercial packaging and transport companies, Chloromone and Oriole Chemical Carrier, lie on the immediate northwestern boundary of the facility. Star Enterprises (Star), a division of Texaco, operates a large oil and petrochemical refinery south of the facility. A "landfarm" area east of the facility's disposal impoundments area is part of the Star property

Two CERCLA sites, Standard Chlorine, a manufacturer of chlorinated solvents, and Tybouts Corner Landfill, a former municipal solid waste landfill are 0.4 miles and 2.5 miles west of the facility, upstream along Red Lion Creek. These sites are known to have released contaminants into Red Lion Creek upstream from the OxyChem property. Standard Chlorine had releases of chlorinated benzenes in 1981 and 1986. They flowed onto the ground surface and into an unnamed tributary which discharges to Red Lion Creek. Tybouts Corner Landfill is located near the headwaters of Red Lion Creek. A Remedial Investigation conducted in 1984 showed the landfill was releasing VOC constituents to Red Lion Creek. A database search revealed that there are no other facilities or sites within 1 mile of the OxyChem facility that may be sources of potential contaminants to Red Lion Creek.

The nearest residential area is over 1.5 miles northwest of the facility. There is an extensive band of open space used as a wildlife refuge along the Chesapeake and Delaware Canal 3 miles south of the facility. There are also dredge spoil areas along the canal and Delaware River which are owned and maintained by the U.S. Army Corps of Engineers. A land use map for the area around the facility is presented in Figure 1-2.

1.1.3 *Topography and Drainage*

The topographic contours on Figure 1-3 show drainage patterns trending toward the Red Lion Creek flood plain. However, surface runoff at the facility is controlled by a series of sewers and drainage ditches. Runoff from containment areas is collected into a sewer that goes to the wastewater treatment plant. Following treatment, the wastewater is discharged to the Delaware River under OxyChem's NPDES permit. Figure 1-3 does not show the current topography of the New Brine Sludge Landfill.

Runoff from non-containment areas within the processing area drains into a ditch which runs east-west along the north service road. This ditch flows into the facility's effluent line which then discharges to the Delaware River. When the runoff volume is greater than the capacity of the effluent pipe, the discharge from the drainage ditch is diverted to a culvert which discharges to the Red Lion Creek flood plain.

Runoff from the former impoundments drains into culverts that discharge to the Red Lion Creek flood plain.

1.1.4 *Description of SWMUs*

In Task I, Description of Current Conditions, the SWMUs at the facility were categorized into three groups: SWMUs of Concern; SWMUs of

Minimal Concern; and SWMUs of No Concern. The SWMUs were grouped in this manner to more easily determine which SWMUs should undergo an RFI. The SWMUs of No Concern were determined not to require investigation as they pose no potential threat of constituent release because they have received only small volumes of waste, they are designed/constructed with secondary containment, and/or they are part of OxyChem's active production or wastewater treatment process which are routinely maintained. A site facilities map showing the locations of all SWMUs listed by EPA is presented in Figure 1-4.

The SWMUs of Minimal Concern were also considered in the RFI because existing data were not sufficient to determine whether or not constituent releases had occurred from these units. Seven SWMUs have been considered during the RFI. These SWMUs include the six disposal impoundments and a former storm water drainage pond. A description of each SWMU is presented below:

Waste Lake No. 1

Waste Lake No. 1 (WL-1) is a 2.3 acre triangular shaped landfill on the north side of the facility, adjacent to, and south of, Red Lion Creek. It is no longer in use and was capped in 1979 with 12 to 24 inches of clay and 4 inches of topsoil.

From 1965 to 1979, WL-1 received PVC solids, barium sulfate, calcium sulfate, sulfides, carbonates, chlorides, and mercury, in various states and forms. Waste-stream flows to the lake included caustic railroad tanker and truck washings, cooling tower blowdown and other general facility washdowns. The unit had a waste capacity of approximately 35,000 cubic yards (A. T. Kearny, Inc., 1986).

From Summer 1965 to Spring 1971, WL-1 was also used as a flow-through basin by Standard Chlorine, which discharged treated wastewaters from its chlorobenzene process to the Delaware River. OxyChem did not provide treatment for this wastewater, but merely a flow channel to allow Standard Chlorine access to the Delaware River through WL-1 and the overflow channel.

Waste Lake No. 2

Waste Lake No. 2 (WL-2) is a 48-acre lagoon in the northeast corner of the facility, just east of WL-1. It is bordered on the east by the Delaware River and on the north by Red Lion Creek.

From 1965 to 1977, WL-2 primarily received stormwater runoff from surrounding areas and overflow wastewater from WL-1. WL-2 also

served as a water retention and evaporation lagoon and a "no discharge" lagoon to store treated facility wastewater. In the late 1960s, solid wastes from WL-1 were placed in the southwest corner of WL-2 to enable additional solids settling in WL-1. In the early 1970s PVC solids were discharged directly into the Southwest Corner of WL-2. This unit had a volume of approximately 240 acre-feet, with a depth that varied from 2 to 10 feet. A soil cap was completed in 1983.

Waste Lake No. 3

Waste Lake No. 3 (WL-3 or PVC Landfill) is a 3.1-acre elongate shaped landfill located approximately 200 feet southwest of WL-1. From 1970 to 1982, WL-3 received approximately 35,000 cubic yards of wastes from the PVC processing area. A low-permeability soil cap was completed in 1982.

Old Brine Sludge Landfill

The Old Brine Sludge Landfill (OBSL) is a 3.2 acre landfill located directly east of the facility processing plant and approximately 20 feet south of WL-3, at its west end. This unit is situated between two railroad spurs in a former channel of a small, northward flowing tributary of Red Lion Creek.

From 1970 to 1979, the OBSL received approximately 32,000 cubic yards of wastes that consisted of mercury-laden brine sludges. These wastes resulted from the removal of inorganic impurities during electrolysis of the salt brine solution.

The OBSL was closed and capped in 1979.

New Brine Sludge Landfill

The New Brine Sludge Landfill (NBSL) is located south of the OBSL. It is separated from the OBSL by a railroad berm and roadway. This SWMU is a closed RCRA unit, consisting of two landfill cells, which cover a combined area of approximately 4 acres with an average depth of 8 feet. Cells 1 and 2 are separated and completely contained by synthetic liners.

The wastes were similar to those disposed of in the OBSL, which consisted of mercury brine sludges resulting from the removal of inorganic impurities during electrolysis of the salt brine solution. The NBSL received waste from 1979 to 1988. An engineered RCRA-type cap was completed for this SWMU in 1992.

Chemfix Test Unit

The Chemfix Test Unit is a 10,000 square foot test area located beyond the northern fence line of the facility processing area.

In 1975, this unit was excavated and filled during pilot tests for development of a fixation process for mercury-laden brine sludge. Four test cells (each 25 feet by 100 feet), plus a start-up basin and surge basin, were constructed. The brine sludge mixture was prepared on the brine sludge pads. Approximately 100,000 gallons of mercury-laden brine sludge and 18,000 gallons of mixed brine and PVC bio-plant sludge (2 to 1 ratio) were pumped to the Chemfix Test Unit.

Former Storm Water Drainage Pond South of WL-1

The Former Storm Water Drainage Pond area is approximately 1 acre in size and is located about 100 feet south of the west end of WL-1 and 100 feet northeast of WL-3. The pond area is separated from these SWMUs by railroad and roadway berms.

This unit initially served as a natural retention basin for stormwater runoff from the south side of the facility. The pond was approximately 8 feet deep and retained a maximum volume of 2.3 acre-feet.

Since facility operation began, the pond collected stormwater from various plant areas, such as the Chlor-Alkali facilities, PVC facility, and Star property, as well as from Conrail and Delmarva Power and Light, which own railroad lines near the former pond area. A concrete culvert was installed in 1978 and currently directs surface water from this area and the closed SWMUs on the south side of the facility (WL-3, the OBSL, and the NBSL) to Red Lion Creek.

1.1.5 *Site History*

The plant began operation in 1965 under the ownership of Diamond Alkali, and has since undergone several name changes and one ownership change. The plant was owned by Diamond Shamrock Corporation when its waste facilities were permitted by the State of Delaware Department of Natural Resources and Environmental Control (DNREC) in 1979 under Solid Waste Permit SW-79/13. The ownership of the plant was transferred to OxyChem in 1986.

A review of four aerial photographs from 1937, circa 1960, 1976, and 1985 (Figures 1-5 through 1-8) provides a chronology showing the facility site prior to construction through the operation and then closure of many of the SWMUs. A summary of each photograph is provided below.

1937

At this time, the site is occupied by a farm with cultivated fields. Tide gates are present at the confluence of Red Lion Creek and the Delaware River and appear functional. There is open water at all the future SWMU locations except the Chemfix Test Unit and the NBSL. There is a tributary stream to Red Lion Creek in the present location of the NBSL. This tributary flows into an arm of Red Lion Creek that is located in the region of the OBSL and WL-3. The locations of WL-1 and WL-2 are part of Red Lion Creek. There is a sand bar between WL-1 and WL-2. There are also tide gates present at the mouth of Red Lion Creek.

circa 1960

The farm is still in existence; however, much of the open water occupying the future SWMU locations, approximately 75 acres, is filled with dredge spoils. The dredge spoil areas are covered with vegetation and are separated from Red Lion Creek by a series of dikes and access roads. A sand bar present in the previous photograph is more pronounced. The Texaco Refinery, now Star Enterprises, can be seen to the south of the site.

1976

The OxyChem Facility is present at this time. WL-1, WL-2, WL-3, the OBSL, and the Chemfix Test Unit are all in operation. The Former Storm Drainage Pond is also present. The white areas in WL-2 may be waste PVC solids that were discharged in the early 1970s. The extent of Red Lion Creek remains essentially unchanged from the previous photograph. The sand bar present in the previous photographs appears to have been buried by more sediment.

1985

All SWMUs present in the previous photograph, WL-1, WL-2, WL-3, the OBSL, and the Chemfix Test Unit, are all closed at this time. The NBSL is present and has one closed cell (Cell 1) and one active cell (Cell 2). The Star Enterprises land farm is present just south of the NBSL. This facility was not present in the previous photograph. Red Lion Creek appears darker than it did in the previous photograph which indicates the creek is deeper. At this time, the tide gate (seen in the upper right corner of the photograph) appear to be washed-out, and Red Lion Creek was receiving water from the Delaware River.

Many of the facility's SWMUs are located in areas that were once tributaries to Red Lion Creek. Information regarding the past flow

patterns and sediment deposits of Red Lion Creek provide some insight to migration pathways of constituents from the facility's SWMUs.

1.1.6 *Regional Geology*

The facility is situated in the Atlantic Coastal Plain physiographic province, which in the Delaware City area is underlain by approximately 1000 feet of unconsolidated sediments. The sediments overlie crystalline bedrock. In descending order the primary geologic units underlying this area are:

- Recent Deposits;
- Columbia Formation (water table aquifer);
- Merchantville Formation (aquitard);
- Magothy Formation;
- Potomac Formation (confined aquifer); and
- Bedrock (metamorphic or igneous).

A geological map showing the regional relationships between these stratigraphic units is presented in Figure 1-9.

Recent deposits of Holocene age comprise the upper zero to 40 feet of sediments and consists of mixed and interlayered sandy-clayey fill and tidal marsh deposits (peat). Surface soils at the facility, except those located in tidal areas, or which have been altered by plant construction and operations, are predominantly Matapeake, Keyport, and Fallsington silt loam, as classified by the United States Department of Agriculture Soil Conservation Service.

The Columbia Formation is Pleistocene in age and underlies the recent deposits and ranges from 10 to 60 feet in thickness. This formation consists of orange to yellow, fine to coarse sands, with interlayered buff and tan sandy silt and clay strata. The Columbia was deposited by a series of Pleistocene river channels. The channels cut through portions of the Merchantville and Magothy Formations. Over time, the channels filled with sediment creating "buried valleys" of fine to medium sands.

The Merchantville Formation is Upper Cretaceous in age and unconformably and discontinuously underlies the Columbia Formation. In many areas, the Merchantville has been completely eroded away by the Pleistocene river channel. The Merchantville is approximately 30 feet thick and consists of dark greenish-gray to dark blue or black micaceous, glauconitic, silty fine sand and clay. Glauconitic soils are hydrous silicate mixtures, rich in iron and potassium. These sediments, which are often

referred to as greensands, have a high cation exchange capacity (CEC) to adsorb heavy metal cations.

The Magothy Formation is also Upper Cretaceous in age. It is approximately 10 feet thick and consists of white and buff quartz sands with layers of gray and black clayey silt. Similar to the Merchantville Formation, the Magothy has been eroded in some areas and is discontinuous.

The Potomac Formation unconformably underlies the Magothy and Merchantville Formations, except where they have been eroded; in these areas, the Potomac Formation underlies the Columbia Formation. The Potomac Formation has been described as variegated red, gray, purple, yellow, and white clays and silts, with interbedded white and brown medium quartz sands with some gravel.

1.1.7 *Regional Hydrogeology*

The sedimentary sequence in the Delaware City area contains two major aquifers: the Columbia water table aquifer and the Potomac Formation, which consists of three confined water bearing zones. The intervening Merchantville and Magothy Formations are confining units. Some perched water zones, caused by low permeability clays and peat, have been identified in the recent sediments; however, these zones are discontinuous.

The Columbia Aquifer is used locally (within three miles of the plant) by a few small-capacity wells north of the plant, on the opposite side of Red Lion Creek. This aquifer and its associated perched zones are recharged by the infiltration of precipitation, primarily in areas north and west of the plant. The mean average annual recharge to the Columbia Aquifer is about 11.2 inches/year as calculated from stream base flow data.

The Potomac Formation is a confined aquifer. It is the major source of ground water in the region for both municipal and industrial supplies. The Potomac Aquifer is separated from the overlying Columbia Aquifer by the Merchantville, Magothy, and the upper silts and clays of the Potomac Formation which serve collectively or independently as an aquitard.

Ground water flow in the Potomac is generally to the southeast toward the Delaware River, following the dip of the Potomac beds. However, local variations in flow direction exist due to pumping from several major well fields in the region. The major users of ground water from the Potomac Aquifer are Star Enterprises, about one mile south of the plant, Delaware City, about two miles southeast, and several small water

companies located north and west of the plant. Additionally, there are scattered users of the aquifer at other locations west of the plant.

The Potomac Aquifer is used by pumping wells screened in each of its hydrologic zones. The Upper Hydrologic Zone (UHZ), which is used by Star, is approximately 250 to 300 feet below the land surface. In the vicinity of the site, ground water flow in the UHZ is toward the north and northeast with a gradient of 15 feet/mile (0.003) and a Darcy calculated velocity (porosity assumed to be 30 percent) of approximately 0.28 feet/day (9.9×10^{-5} cm/sec) (A.T. Kearney, RCRA Facility Assessment of Diamond Shamrock, 1986).

In general, the Potomac Aquifer is recharged by infiltration of water from overlying sediments wherever vertical permeability and downward hydraulic gradients are high. The major recharge area for the aquifer is north and west of the facility where the aquifer directly underlies permeable recent sediments. At the plant site, the low permeability of the confining units (Merchantville and Magothy Formations and silts and clays of the Upper Potomac Formation) precludes significant recharge to the Potomac Aquifer.

1.2 *REGIONAL ECOLOGY*

Red Lion Creek is a small formerly tidal tributary to the Delaware River which discharges through tide gates to the Delaware River at Mile 62. This portion of the river is considered the *Brackish Upper Estuary* (Bryant and Pennock, 1988). However, the salinity of the river varies seasonally. During periods of high river flow, which usually occur in the spring, the river has been freshwater as far south as the Chesapeake and Delaware Canal, approximately 3.5 miles downstream of the facility (River Mile 58.5). During droughts, saline water has reached Philadelphia, approximately 25 miles upstream.

The natural shoreline of this section of the river was once predominantly tidal marshes. The brackish upper estuary was a transition zone between freshwater and brackish water species. Hence, plant and animal diversity was high but quite variable on a seasonal basis. A conceptual food chain of the region is shown on Figure 1-10.

Above the marshes at higher elevations, dense coastal forests and forested wetlands were present. This forest has largely been removed and converted to agricultural, residential, commercial and industrial uses, but remnants remain. Likewise the tidal marshes have been altered to support development.

Pea Patch Island is located within the middle of the Delaware River approximately 2 miles east of the mouth of Red Lion Creek and the facility. DNREC has identified Pea Patch Island as a state dedicated natural area because one of the largest heron rookeries in the northeastern United States is located there. Other designated natural areas include wildlife refuges along the Chesapeake and Delaware Canal, and the Killcohook National Wildlife Refuge located 1 mile east on the eastern Delaware River shore.

Common regional plant species included species common to coastal forests and marshes. Cord grasses (*Spartina*), sedges such as three-square sedge, water hemp, arrow arum, wild rice, yellow water lily and cattails are a few of the more common species in this region. The regional marsh vegetation is now composed primarily of common reed (*Phragmites*).

Common reed is an opportunistic species that establishes itself in disturbed areas and aggressively replaces the indigenous plant species. It replaces the more diverse natural vegetation especially in areas were tidal fluctuation has been curtailed.

Most of the regional tidal creeks such as Red Lion Creek, have been altered by the installation of tide gates just above the creek's mouth. The tide gates effectively prevent the normal tidal cycle of flooding and ebbing. The Red Lion Creek tide gate was installed and maintained by the Delaware Department of Transportation to prevent flooding of Route 9.

Red Lion Creek and the Delaware River provide habitat for a number of fish and invertebrate species that can tolerate brackish water conditions. In general, both freshwater and estuarine species are present in the adjacent river on a seasonal basis. Several estuarine species can tolerate both saline and freshwater conditions and may be present year round. These common species include white perch, river herring and mummichogs.

Many estuarine and ocean dwelling species migrate up and down the Delaware River. Anadromous fish such as the American shad migrate through the estuary to spawn in upstream freshwater areas. Juvenile anadromous fish remain in the Delaware River and tributaries until they mature. Catadromous fish such as the American eel migrate to the Atlantic Ocean to spawn. These species spend their adult life in freshwater streams.

Animal life of the region includes a variety of species associated primarily with the marshes. The largest game animal in the region is the white-tailed deer. Other mammals include fox, mink, raccoon, opossum, muskrat, cottontail rabbit and various rodent species. Reptiles and

amphibians are also common to the region. Bull frogs and green frogs are common on the freshwater streams. Snapping turtles and green back turtles are very common.

The region is located along the Atlantic Flyway and thus attracts a large number of birds migrating along the east coast of North America. Wading birds, gulls, rails, terns and waterfowl such as mallards, ruddy, black, teals, coots and mergansers are common. In addition, resident bird species are numerous. Birds of prey including ospreys, northern harriers, and bald eagles have also been reported to occasionally occur in the region.

The heron rookeries on Pea Patch Island and others within Delaware and New Jersey are considered natural areas of concern due to their limited numbers. Ten birds considered by DNREC as rare due to limited breeding activity in the state, breed on Pea Patch Island. These species include black-crowned night-heron, cattle egret, glossy ibis, great blue heron, great egret, little blue heron, snowy egret, tricolored heron, yellow-crowned night-heron, and the warbling vireo.

1.3 *INVESTIGATION APPROACH*

The scope of work for the RFI has been focused to identify SWMUs that have released constituents or could potentially release constituents to the environment. The investigation has been focused to identify chemicals which are of concern and have been managed at the SWMUs. The investigation activities have been selected to provide the data necessary to determine if releases have occurred or are occurring, and provide the data necessary to develop corrective measures as described in the Task II, Pre-Investigation Evaluation of Corrective Measure Technologies.

It was determined that effective performance of the RFI would require a phased approach to enable step-by-step characterization, evaluation, and assessment of each SWMU regarding its potential impact to human health and the environment. Hence the three phases of work described in the Work Plan were developed, as listed below:

- Phase I - Characterization of SWMUs;
- Phase II - Evaluation of Migration Pathways; and
- Phase III - Assessment of Potential Receptors.

Performance of the investigation in these three phases was to provide an optimum return of data for the effort and resources invested by beginning at the potential source areas and moving outward through the migration

pathways toward the points of potential human and environmental exposure. It was considered that the area(s) under investigation and parameters of concern may be narrowed at each consecutive phase of investigation to focus on the areas potentially requiring corrective measures.

In this phased approach, the scope of work for each phase would depend significantly on the results of the preceding phase(s) of the study. Therefore, the activities described in the original Work Plan for Phases II and III were presented as tentative plans subject to modification based on the data obtained from Phases I and II, respectively.

1.4 *ORGANIZATION OF REPORT*

This report is a compilation of data and information obtained from the RFI. The sections presented in this report provide the following information:

- Section 1, Introduction, gives the purpose for the RFI and provides a brief site description.
- Section 2, Investigation Activities, summarizes the RFI approach and describes the activities performed during the RFI.
- Section 3, Investigation Results, presents the results of the RFI, including site physiography, geology, hydrogeology, and characterization of SWMUs.
- Section 4, Phase I Conclusions, presents conclusions for the RFI relative to further evaluation of the site during the Phase II RFI.
- Section 5, Phase II Scope of Work, indicates that the results of the Phase I will be used to develop a Phase II RFI work plan which will be submitted under separate cover.

Section 1 Figures

Figure 1-9
Regional Geologic Map
Occidental Chemical Corp.
Delaware City, Delaware

Kml

Mount Laurel Formation
Gray to greenish red-brown, glauconitic, fine to medium quartz sand with some silt. Extensively burrowed. Over 100 species of mollusks. Upper red sand has been called Redbank Formation, but appears to be, in part, a weathering product of Mt. Laurel, and in part weathered Columbia Fm (?).

Kmt

Marshalltown Formation
Dark greenish gray, massive, highly glauconitic, very silty fine sand. Abundant EXOGYRA PONDEROSA.

Ket

Englishtown Formation
Light gray and rust brown, well sorted, micaceous, sparingly glauconitic, often "fluffy", fine sand with thin interbedded layers of dark gray silty sand. Abundant nodulose burrows of CALLIANASSA, particularly in upper sands.

Kmv

Merchantville Formation
Dark gray to dark blue, micaceous, glauconitic sandy silt and silty fine sand; very sticky when wet. PLACENTICERAS PLACENTA, small siderite nodules, burrows by benthic organisms.

Km

Magothy Formation
White and buff, frequently sugary, clean quartz sand with beds of gray and black clayey silt containing much lignite, pyrite-filled limy clay concretions, and sulfate blooms. Formation discontinuous along strike in subcrop.

Kpt

Potomac Formation
Variegated red, gray, purple, yellow and white, frequently lignitic silts and clays containing interbedded white, gray, and rust-brown quartz sands and some gravel. Individual beds usually laterally restricted.

Facility Property

30 — Columbia sediment thickness (revised from Spoljaric, 1967). Dashed where inferred. Thickness in feet.

1000 0 1000 2000
Scale in Feet

N

Delaware River

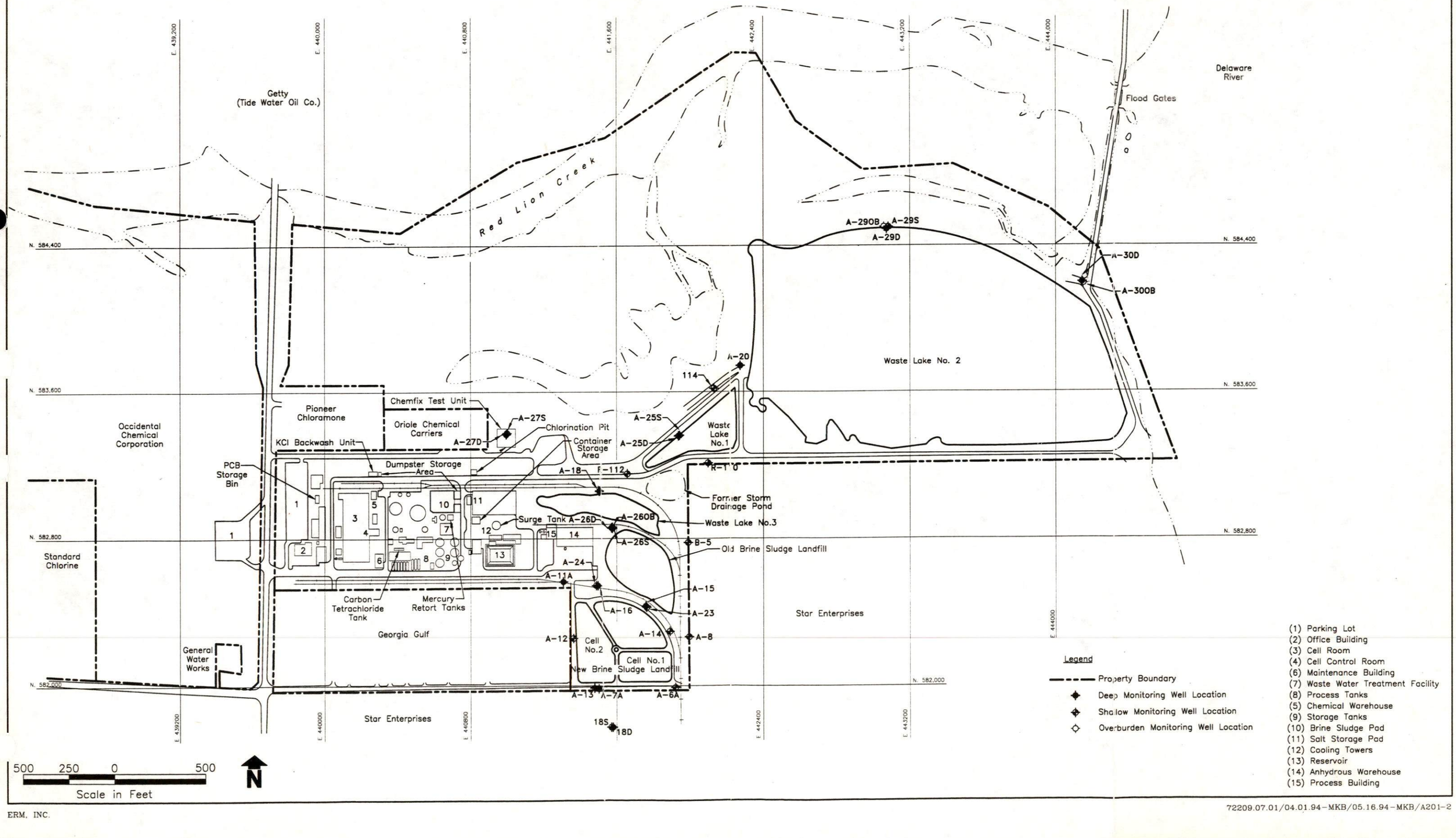
Hamburg

Lebanon Ch
Red Lion
Red Lion Creek
Van Hook Sch
Kmy
Reybold
BM
Reybold Cove
King's College
Corbit
Wrangle Hill
Kmv
Ket
Kmt
Delaware City
(BM 9)
Ruins
Dragon Creek
Cedar Cr
Concrete Pier
Submerged Dike
GOVERNOR BACON HEALTH CENTER
Standpipe (C)
Cem
Tank
Light
Birds Corner
Cox Neck Lane
DELAWARE CITY BRANCH CHANNEL

DISTRICT NO 12

72209.07.01 / ADC 4.6.94 / rev 5.17.94

Figure 1-4
Site Facilities Map
Occidental Chemical Corporation
Delaware City, Delaware

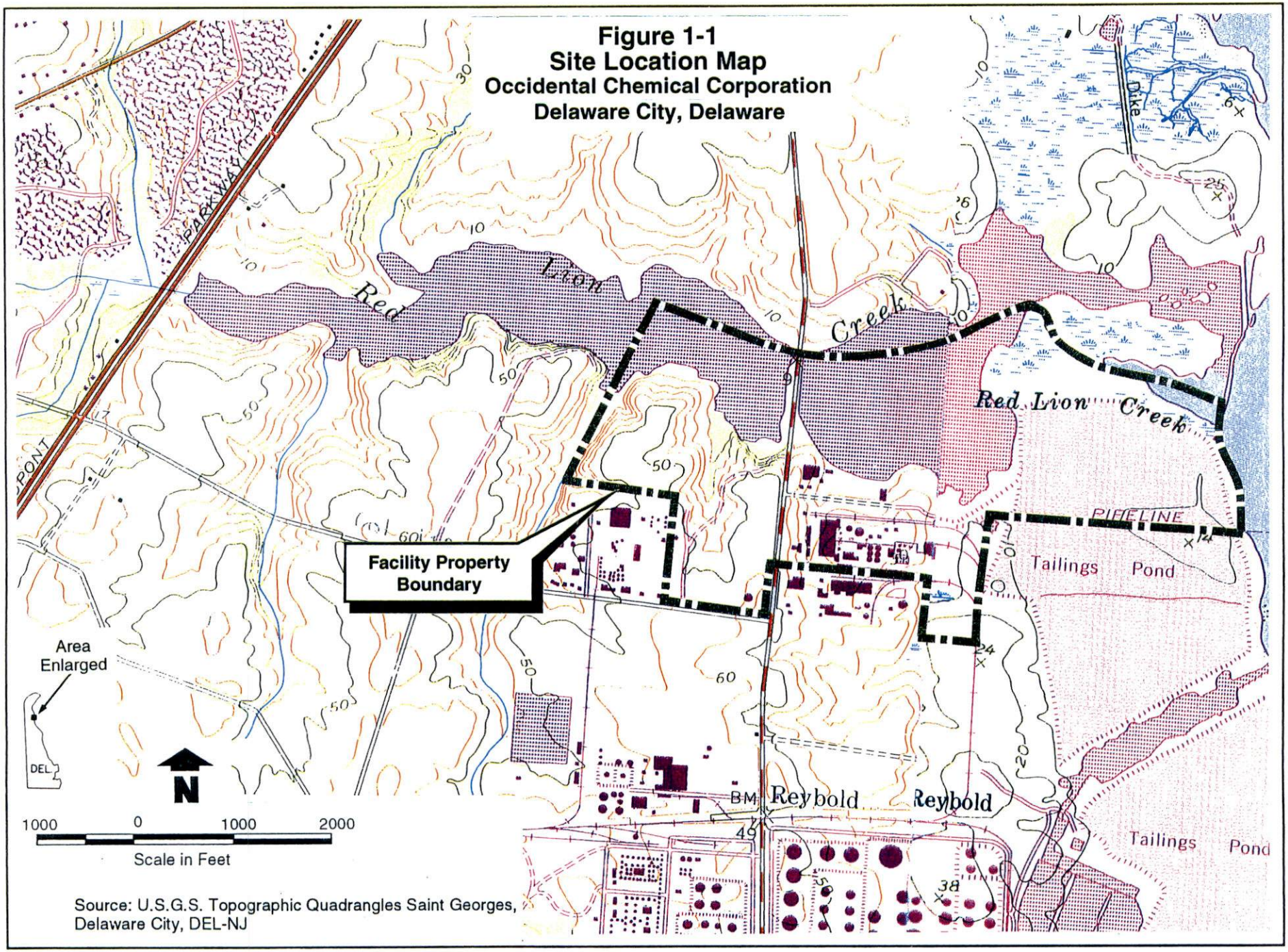


ERM, INC.

72209.07.01/04.01.94-MKB/05.16.94-MKB/A201-2

ERM, Inc.

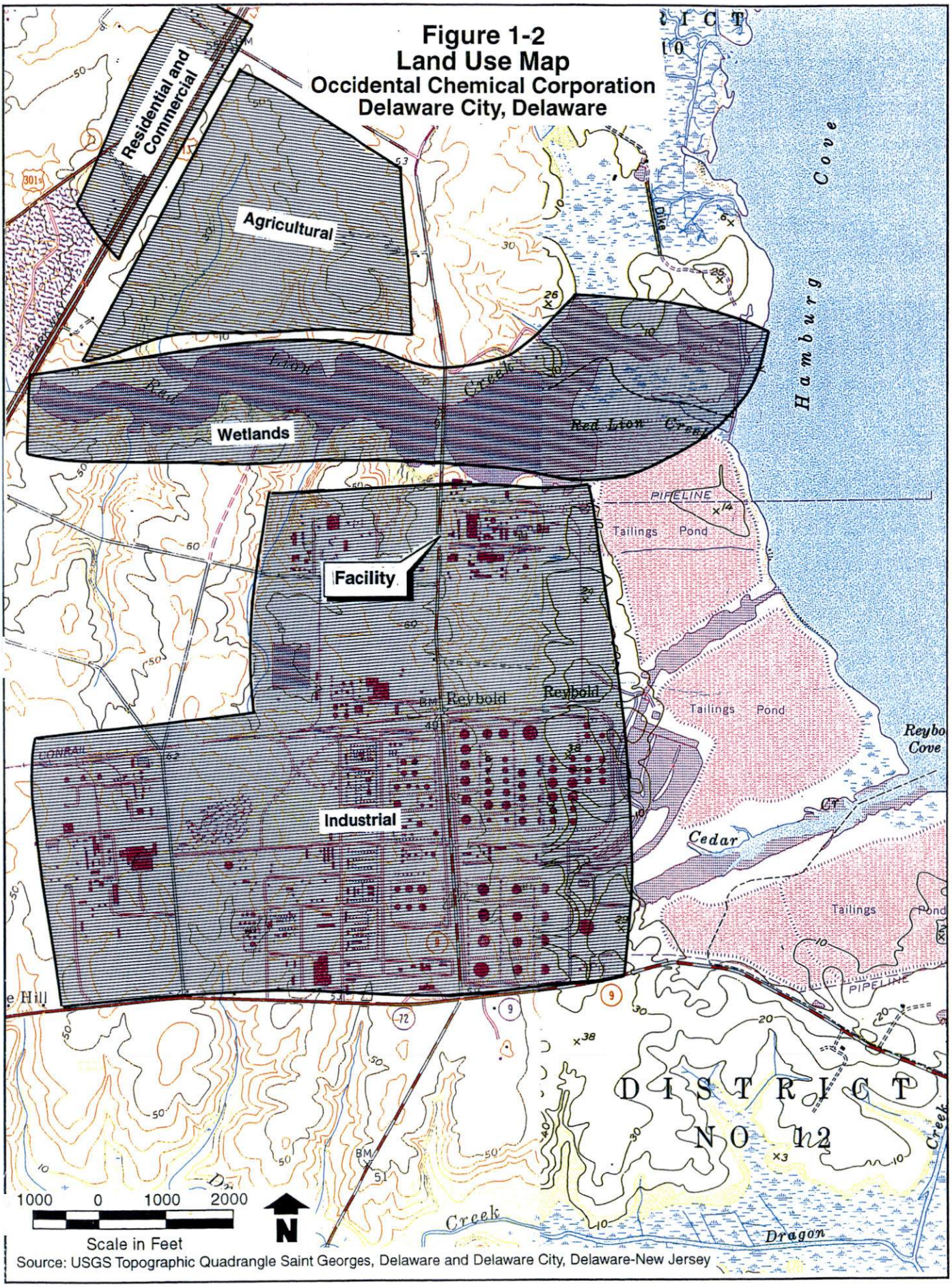
Figure 1-1
Site Location Map
Occidental Chemical Corporation
Delaware City, Delaware



Source: U.S.G.S. Topographic Quadrangles Saint Georges, Delaware City, DEL-NJ

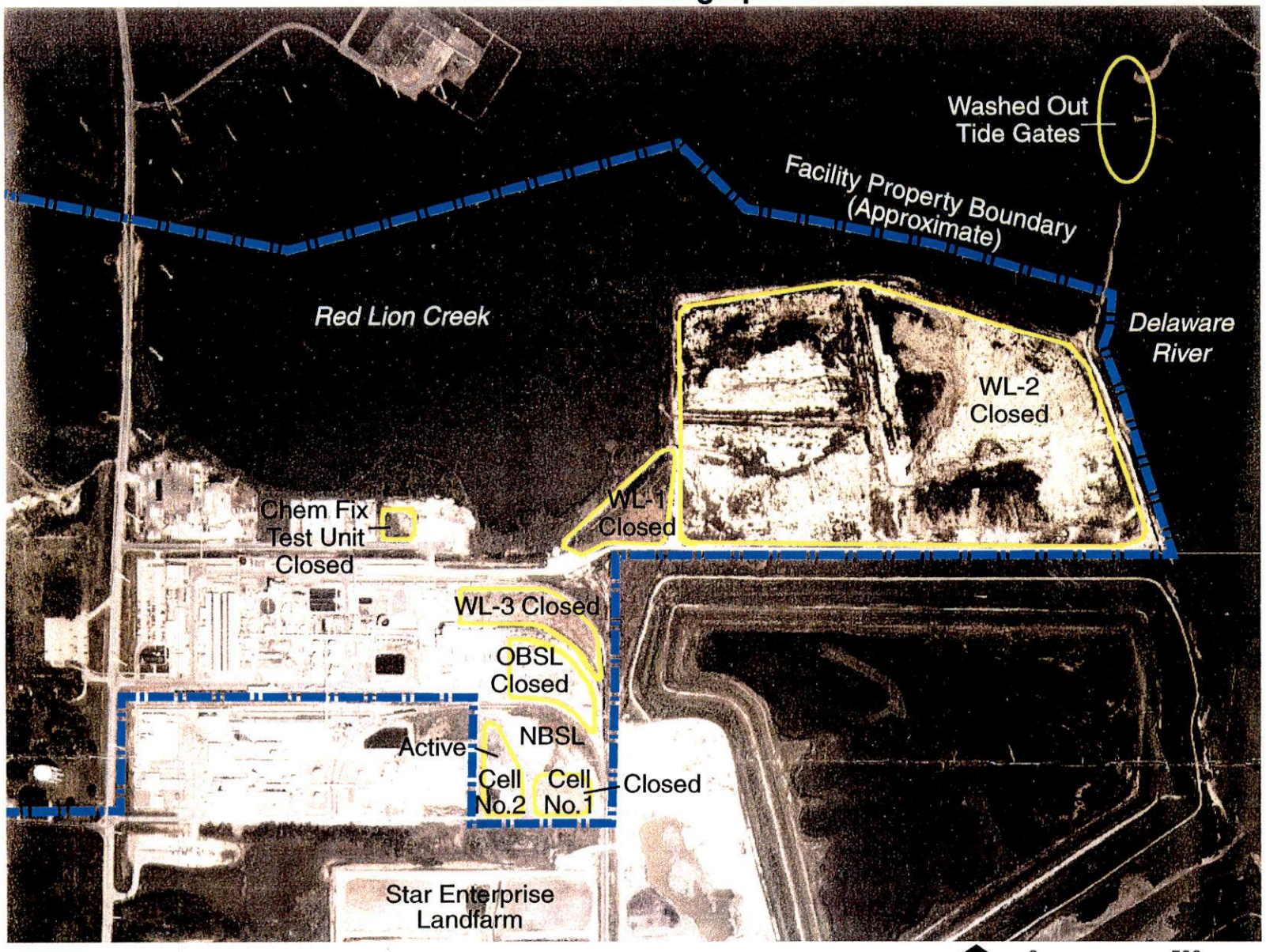
7209.07.01 / DG 8.16.93 / rev 5.17.94

Figure 1-2
Land Use Map
Occidental Chemical Corporation
Delaware City, Delaware



Source: USGS Topographic Quadrangle Saint Georges, Delaware and Delaware City, Delaware-New Jersey

Figure 1-8
Historical Air Photograph 1985

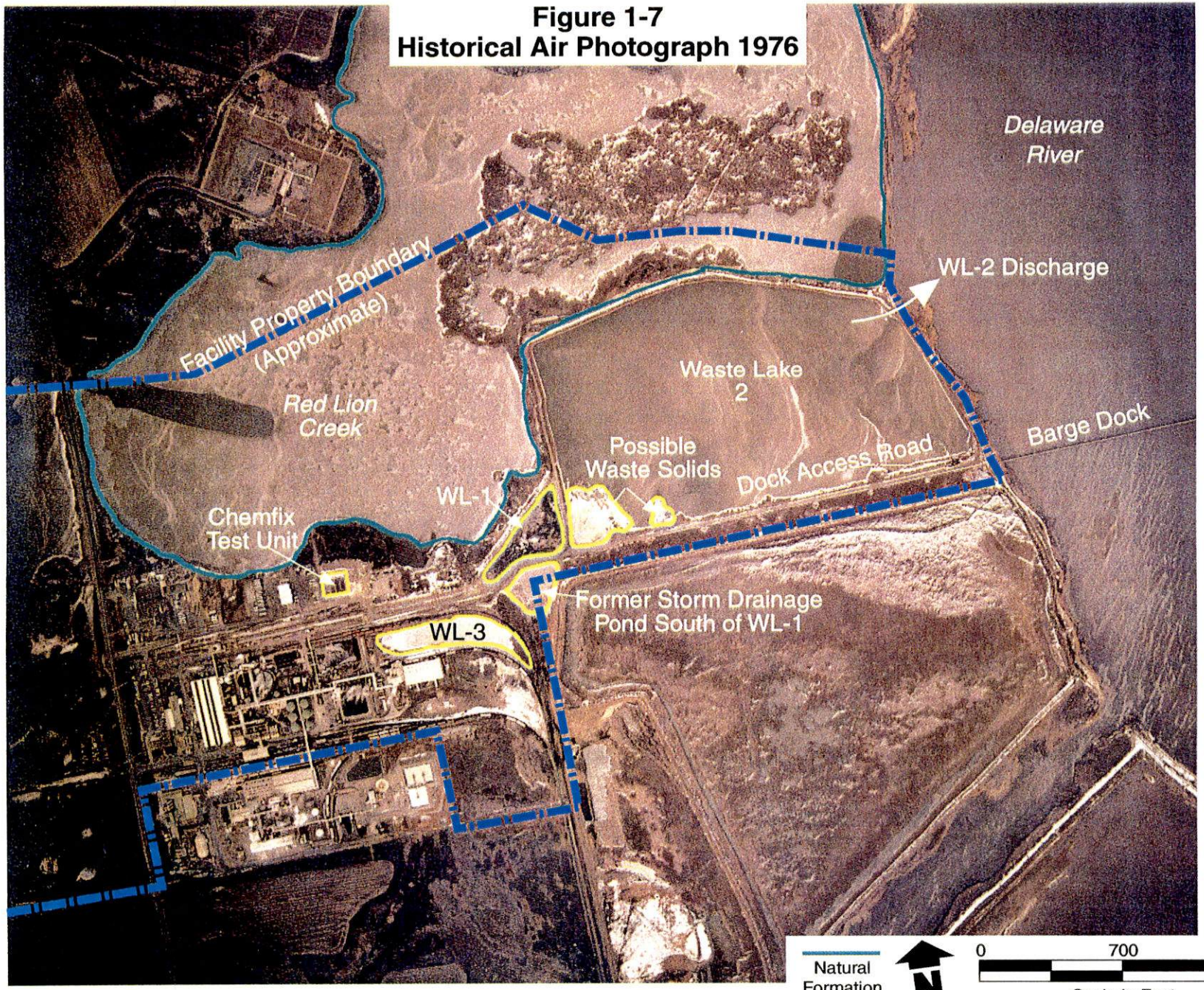


ERM, INC.

7220907.01 / 4.22.94 DL

ERM, INC.

Figure 1-7
Historical Air Photograph 1976



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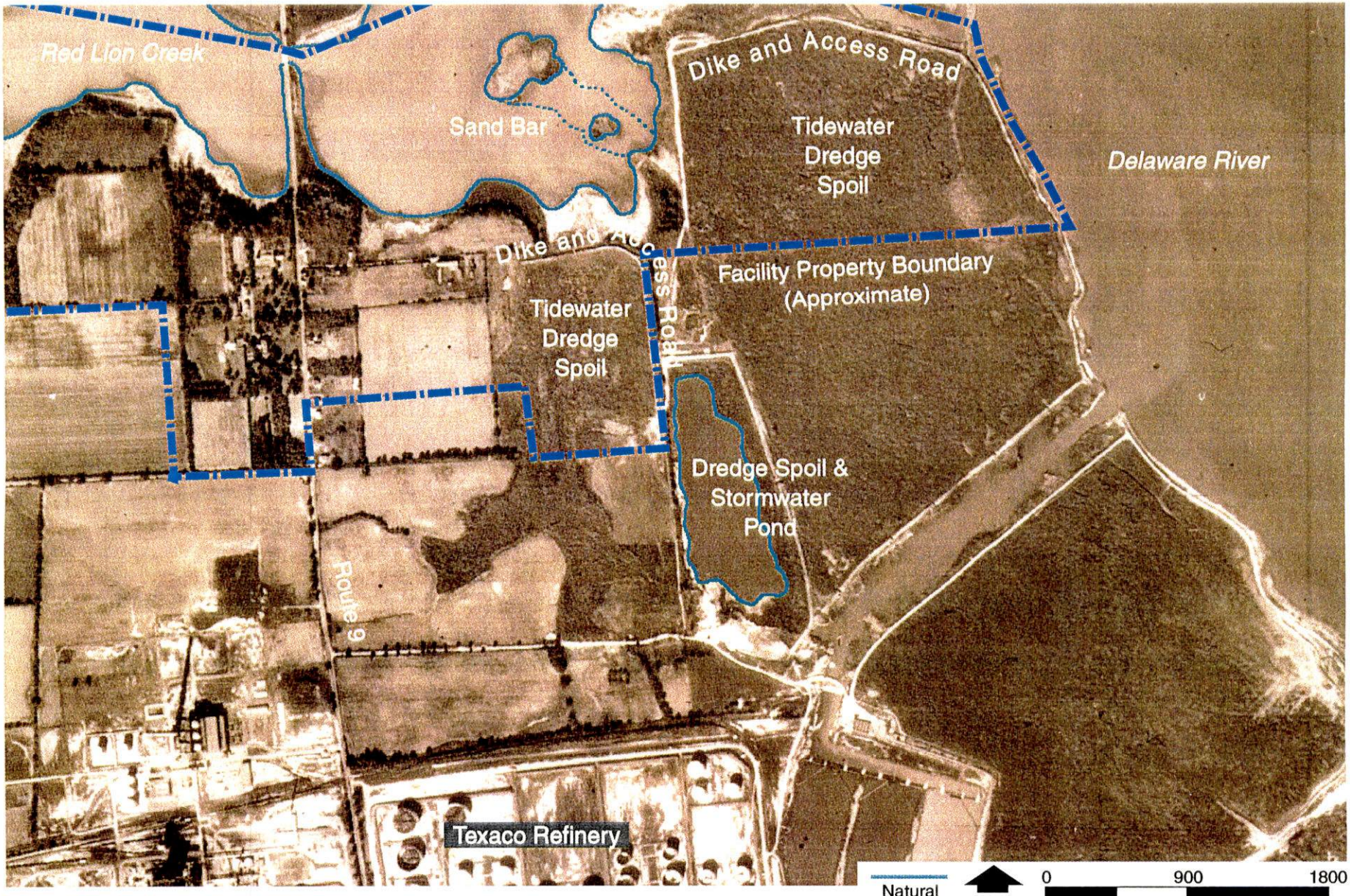
ERM, INC.

Figure 1-6
Historical Air Photograph Circa 1960



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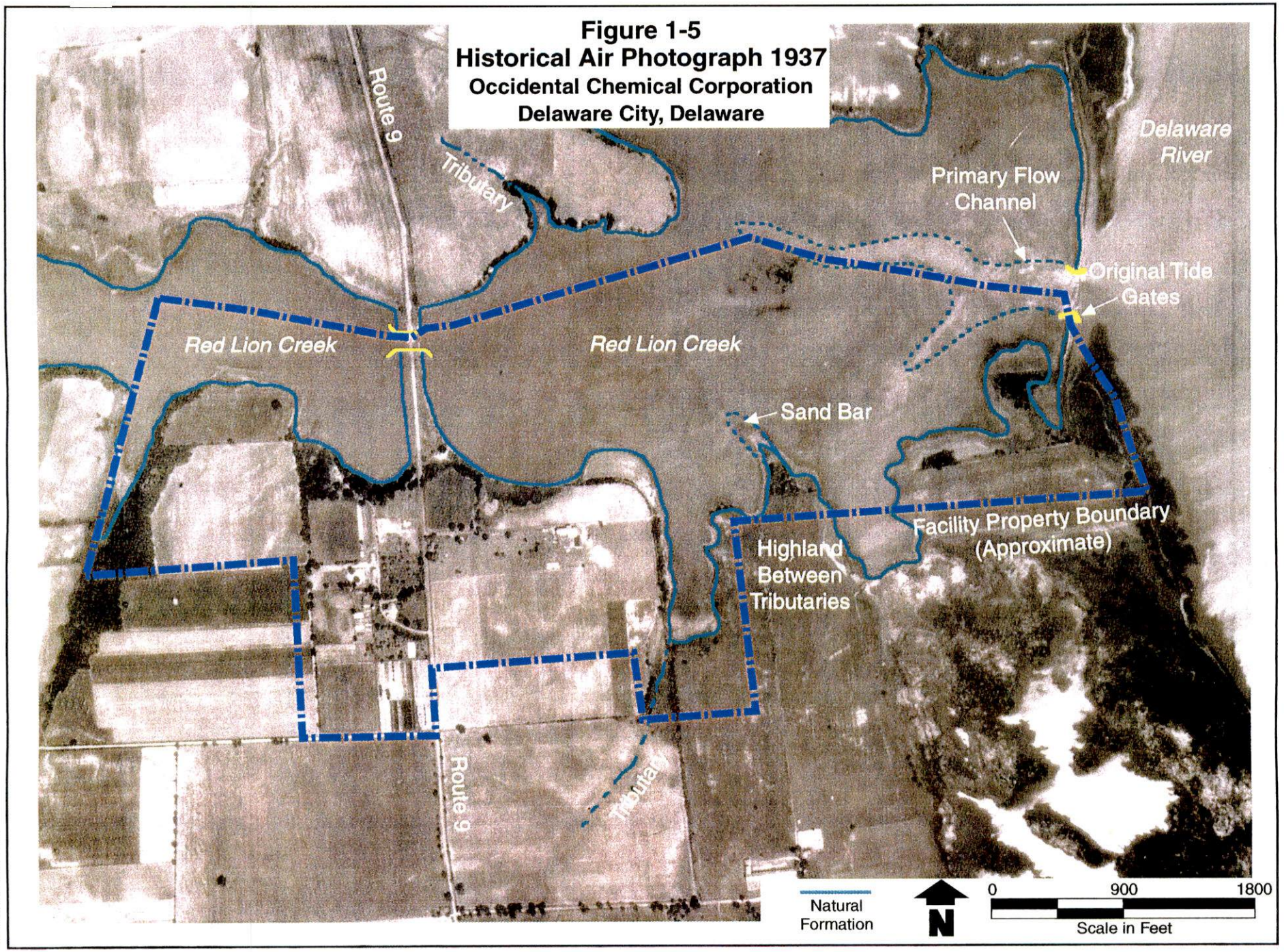
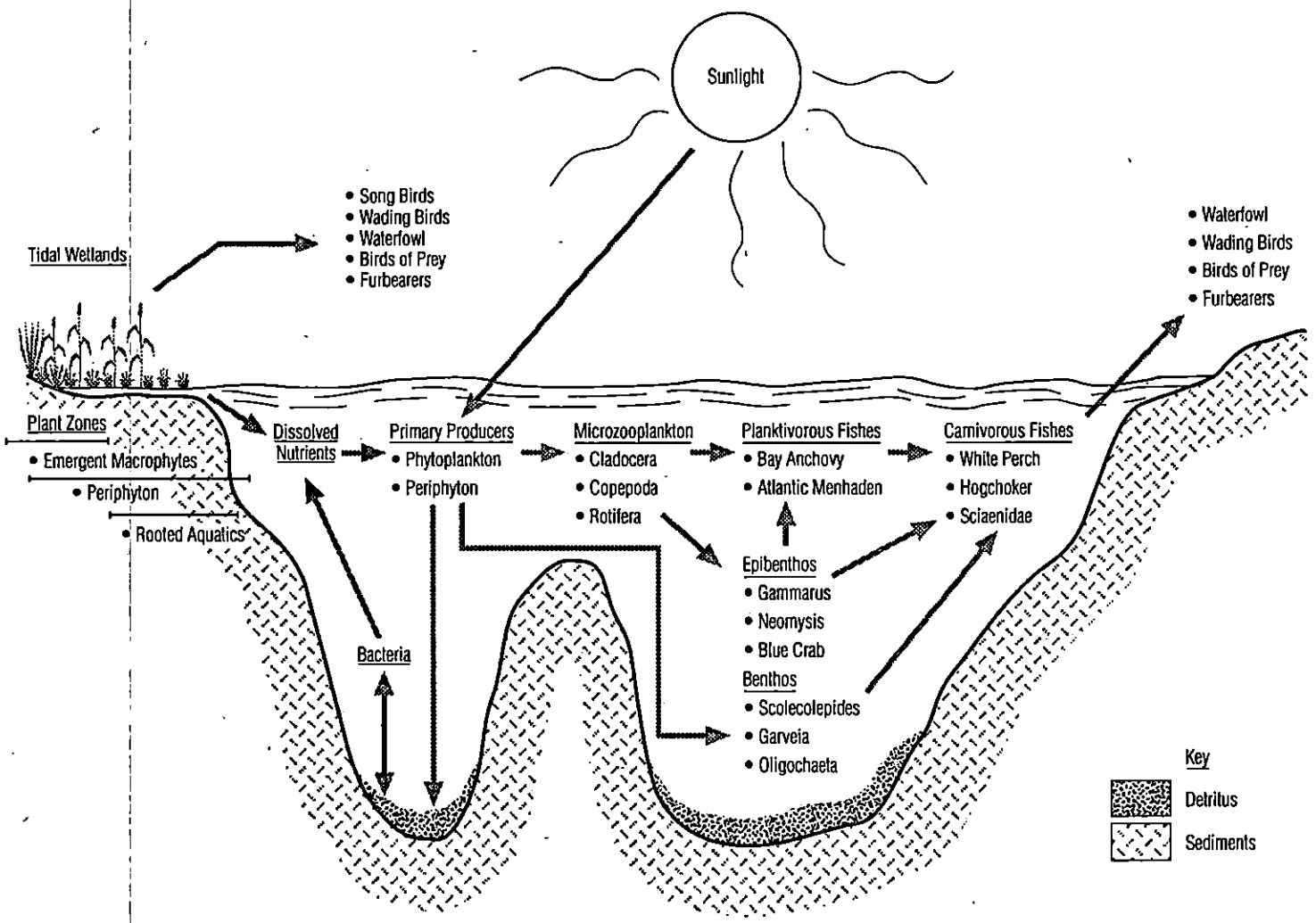


ERM, INC.

72209.07.01 / 4.22.94 DL

ERM, INC.

Figure 1-10
Simplified Food Web for the Delaware River (River Mile 63)



Source: Modified from Tyrawski, 1979.

Section 2

2.0 INVESTIGATION ACTIVITIES

2.1 PHASE I SCOPE OF WORK

The intent of the Phase I RFI has been to identify and characterize SWMUs which are source areas for constituent release and migration. In particular, this phase of the investigation was developed to provide data regarding the following site conditions: physical and chemical properties of the wastes and/or affected site media; the extent, depth and volume of affected media; and information pertaining to potential release mechanisms (e.g., ground water levels, flow direction, aquifer characteristics, etc.). These data have been collected in the immediate vicinity of each SWMU. Additionally, pertinent information regarding general site conditions (e.g., site geology, hydrogeology, and environmental setting) have been gathered to supplement the information in the Task I, Description of Current Conditions. The activities conducted during the Phase I RFI are listed below and described in the paragraphs which follow. The locations for sample collection and other investigation activities are presented in Figure 2-1.

- Aerial photograph interpretation;
- Geophysical investigations;
- Soil gas survey of Standard Chlorine pipeline;
- Surface soil sampling;
- Waste boring program;
- Soil boring program;
- Ground water monitoring well installations;
- Ground water quality study;
- Ground water level study;
- Evaluation of Potomac Aquifer;
- Phase I ecological assessment: and
- Phase I human health assessment;

2.1.1 *Aerial Photograph Interpretation*

Historical aerial photographs of the site were obtained from EPA Region III who had previously obtained photographs of the site representing four historical time periods: 1937, circa 1960, 1976, and 1985. The photographs

have been studied to identify former surface water courses for Red Lion Creek and its tributaries, which may serve as buried natural conduits for constituent migration. The photographs were also studied to obtain preliminary estimates of the extent of wastes in WL-2, the Chemfix Test Unit, and other SWMUs. A discussion of the aerial photographs is presented in Section 1.1.5.

2.1.2 *Geophysical Investigations*

Surface geophysical investigations were performed in the areas of WL-2 and the Chemfix Test Unit. An electromagnetic conductivity (EM) survey was performed for WL-2 and a ground penetrating radar (GPR) survey was performed for the Chemfix Test Unit. The areas covered by these surveys are presented in Section 3. Data from these surveys were used to better define the locations, lateral extents, and the depths of the wastes (to the extent possible) in these areas. These results were also used to determine waste and soil boring locations in the vicinity of these SWMUs.

In spite of the GPR results for the Chemfix Test Unit, during drilling of the monitoring wells at this unit, a gray waste-like material was encountered at approximately 3 feet below ground surface. In order to supplement the data obtained using the GPR equipment, seventy-seven shallow borings were drilled using a hand power auger to determine the extent of the waste material. The borings were drilled at the nodes of the GPR grid system, approximately every 10 feet in the east-west and north-south directions. The borings were 1 inch in diameter and approximately 2 to 4 feet deep. Visual inspection of the cuttings was used to determine the presence of waste material.

2.1.3 *Soil Gas Survey of Standard Chlorine Pipeline*

A soil gas survey was performed along the Standard Chlorine's pipeline right-of-way. The soil gas survey began where the pipeline crosses to the east side of Route 9 and was continuously performed at 50-foot intervals to the southeast corner of WL-1, where the pipeline consists of a straight, butt-fused length of pipe that runs to Standard Chlorine's discharge at the Delaware River. Two additional soil gas samples were collected at the beginning and end of the butt-fused section of pipe, i.e., at the corner of WL-1 and at the point where the solid pipe section terminates near the shore of the Delaware River. The total length of the pipeline that underwent the soil gas survey was approximately 3,000 linear feet.

It was proposed that if significant levels of VOCs were detected during the soil gas survey (an indication of a release from the pipeline and the subsequent occurrence of a potential soil source area), soil borings and monitoring wells would be installed during Phase I. The locations of these

data points would co-incide with the potential source area(s) to enable collection of soil and ground water samples for laboratory analyses. No significant soil gas concentrations were detected which would indicate a source area resulting from a release. Accordingly, the data did not warrant the performance of such borings or well installations. Further discussion of the field conditions which were encountered in this task is found in Section 3.4.2.

Additionally, it was proposed that available historical records and construction plans for the pipeline would be obtained from previous studies conducted under EPA Region III and DNREC supervision to identify the pipeline materials, any construction modifications, and any leaks that may have occurred. This information was to be used to further identify potential locations in the pipeline where leaks may have occurred. However, a review of available records did not provide any additional information regarding the operational history of the pipeline.

2.1.4 *Surface Soil Sampling*

Three surface soil samples, designated SS-1 through SS-3, were collected from the former Storm Drainage Pond south of WL-1. This area served as a retention basin for surface water until 1978 when a culvert was installed to preclude the ponding of water. Two background surface soil samples, designated SS-4 and SS-5, were collected from locations on the west side of River Road. These background samples were collected from an area of native soil that was not impacted by Standard Chlorine's chlorobenzene spill in January 1986. The background samples serve as a standard for comparison of the results for the soils collected from the former storm drainage pond. Additionally, EPA requested that surface soil samples be collected from WL-1 and WL-2 to provide data for evaluation of direct exposure risks resulting from these SWMUs. One surface soil sample from WL-1, designated SS-6, and four from WL-2, designated SS-7, SS-8, SS-9, and SS-10, were collected. The locations of these samples are shown on Figure 2-1. All soil samples were analyzed for volatiles, semivolatiles, metals, and wet chemistry parameters.

2.1.5 *Waste Boring Program*

A total of 15 waste borings were performed continuously to the base of WL-1, WL-2, WL-3, the Old Brine Sludge Landfill, and the Chemfix Test Unit. The borings were labeled WB-1 through WB-14 and WB-14A (WB-14A was added to the assessment of the Chemfix Test Unit to ensure collection of a sufficient volume of waste from this SWMU for analysis.) The locations for these borings are shown on Figure 2-1. Waste samples from the borings have been used to develop waste profiles, and to determine physical and chemical properties of the waste. The waste samples were analyzed for volatiles,

semivolatiles, metals, and wet chemistry parameters, as noted for each SWMU in the RFI Work Plan.

2.1.6 *Soil Boring Program*

In conjunction with the installation of monitoring wells in the lowermost 10 feet of the Columbia Aquifer, a total of five soil borings were performed in the vicinity of WL-1, WL-2, the OBSL, and the Chemfix Test Unit. The borings were labeled SB-1 through SB-5. Deep Wells A-25D, A-26D, A-27D, A-29D, and A-30D were constructed inside these soil borings. The locations for these boring wells are shown on Figure 2-1.

These borings were drilled to a depth which penetrates the contact between the base of the Columbia Aquifer and the confining silts and clays of the Upper Potomac Formation (or other confining layer, e.g. Merchantville Formation). The field geologist logged the borings based on visual inspection and obtainable borehole geophysical logs for each deep boring. The geophysical data have been used to further delineate the water-bearing strata beneath the site, and to determine formation attributes that may affect the quantity and movement of ground water. The geophysical well log data have been used, to the extent possible, to determine the depths to important geologic units, thicknesses of water-bearing zones, and the correlation of distinguishable lithologic units between wells by comparison of instrument responses.

In addition to the deep soil borings, three shallow soil borings were performed to collect soil samples above the water table near WL-1 and WL-3 to further verify whether or not releases have occurred from these units. The locations of these borings are shown on Figure 2-1 as SB-7, SB-8, and SB-9.

During coordination with Star to site the RFI background boring and well nest on Star property, ERM observed an existing well nest installed by Star in the same area where OxyChem proposed to install the RFI background wells. A review of the well logs provided by Star showed that the existing wells were screened at the desired depths within the Columbia Aquifer for use as the background wells. OxyChem requested that these wells be used during the ground water sampling and the background soil boring, SB-6, be moved to he west side of Route 9, in the area of OxyChem's recreation facility. EPA granted approval for use of Star Wells 18-S and 18-D as background wells, in lieu of installing new wells in the same approximate location on Star property. Additionally, EPA granted conditional approval for collection of background subsurface soil samples in the area of OxyChem's recreation facility. EPA requested certification by OxyChem that the soil in the vicinity of the proposed background boring was not "made land." OxyChem provided a certification letter to

EPA attesting to the plant's knowledge that the soil in that area had not been disturbed.

During soil sample collection at Boring SB-2, which is downgradient from the Old Brine Sludge Landfill (OBSL), ERM-FAST detected the presence of benzene and chlorobenzene at low concentrations in the soil (i.e., less than 10 ppb). Based on OxyChem's historical records, no organic compounds were believed to have been disposed of in the OBSL; and hence, the RFI Work Plan did not include analysis of organic compounds from this boring. However, because of the detection of these compounds during field screening by ERM-FAST, OxyChem requested that the sample showing the highest concentration of organic compounds be analyzed for Priority Pollutant List (PPL) volatile and semivolatile compounds, as well as the previously designated PPL inorganic and wet chemistry parameters.

2.1.7 *Ground Water Monitoring Well Installations*

Ground water monitoring wells were installed at five new locations in the vicinity of WL-1, WL-2, the OBSL, and the Chemfix Test Unit. The locations of these wells which are designated as Wells A-25, A-26, A-27, A-29, and A-30 shown on Figure 2-1. The designations for the new monitoring wells were based on an extension of OxyChem's current well labeling system for its RCRA monitoring wells. However, because the wells for the RFI have been nested as twins and triplets at select locations, a variation of this system was employed to identify overburdened (OB), shallow Columbia (S), and deep Columbia (D) wells.

The number of wells installed at each location to create an appropriate well nest was based on the following geological conditions:

- One well was installed in any significant saturated zone that was perched above the Columbia Aquifer by recent silt and clay deposits;
- One well was installed in the uppermost 10 feet of the Columbia Aquifer; and
- One well was installed in the lowermost 10 feet of the Columbia Aquifer.

It was observed that not all well locations had a perched water zone above the Columbia Aquifer. The recent sediments are hydraulically connected with the Columbia Aquifer. Therefore, only two wells were installed at some locations.

In addition to installing well nests at the locations noted above, consideration was given to installing a new monitoring well in the

uppermost 10 feet of the Columbia Aquifer adjacent to existing Well A-20. This was considered to complete a well nest at this location. Well A-20S was believed to be screened across the lowermost 10 feet of the aquifer. However, inspection of the existing well log at location A-20 showed that the well was actually screened across the middle 10 feet of a 30-foot-thick section of the Columbia Aquifer. It was therefore decided that installation of a new well screened above or below the existing well would not be necessary, as it would not likely reveal any significant new data regarding WL-1.

2.1.8 *Ground Water Quality Study*

A ground water quality study was conducted to define any impacts to ground water attributable to the SWMUs. This study involved the development of the new monitoring wells, inspection of existing site monitoring wells, testing of all wells for hydraulic conductivity, well surveying, ground water level measurements, ground water sampling, and chemical analysis of the samples. The ground water samples were analyzed for volatiles, semivolatiles, metals, and wet chemistry parameters, as noted for each SWMU in the Task III, RFI Work Plan. The data obtained from this study have been used to estimate ground water flow conditions and identify any constituents in the ground water that are representative of releases from the SWMUs.

2.1.9 *Ground Water Level Study*

The ground water level study includes water level measurements for all monitoring wells on an approximately monthly basis over a 12-month period. To date, four of these water level measurement events have been completed and the results are presented in this report. To minimize the potential effects of tidal influence on the water level measurements, the measurements have been performed during the same lunar phase (i.e., every 28 days) and daily tidal cycle. As requested by the EPA, additional ground water level measurement events will be performed within three days following any significant rainfall event. A significant rainfall event is defined as 3 inches in a 24-hour period. To date, no storm events of this magnitude have been recorded at the plant.

Additionally, a 24-hour tidal monitoring program has been performed to study the influences of the Delaware River tidal fluctuations on-site ground water gradients and flow directions. This study included 24-hour continuous monitoring of water levels in selected wells distributed throughout the site. The wells used in this study included Wells A-7A, A-13, 114, A-20, A-26S, A-26D, A-27S, A-27D, A-29S, A-29D, A-29OB, A-30D, and A-30OB. A stilling well was installed on the facility's pier to monitor tidal fluctuations in the Delaware River. Two monitoring events were

performed to assess whether tidal influences are present, i.e., new moon and full moon phases (approximately two weeks apart).

2.1.10 *Evaluation of Potomac Aquifer*

Existing data pertaining to the Potomac Aquifer have been obtained and reviewed, particularly with respect to potential interconnection between the Columbia and Potomac Aquifers. The literature search has included review of previous studies conducted for the OxyChem site and available studies conducted at nearby facilities (e.g., Standard Chlorine).

2.1.11 *Phase I Ecological Assessment*

The objective of the Phase I Ecological Assessment was to support the decision making process associated with the conduct of a corrective measures study (CMS) through identification of individual SWMUs potentially posing unacceptable risks to likely receptors. In order to satisfy this objective, the Ecological Assessment focused on the identification of human and ecological receptors and the determination of preliminary human and ecological constituents of potential concern. These tasks were accomplished by conducting a review of existing site assessments, human census data, regional ecological data, and results of environmental sampling. In addition, a site walkover was conducted to characterize the existing ecological conditions of the site. The methodology described below for each task followed the RFI.

2.1.11.1 *Potential Receptor Survey*

A receptor survey was performed to characterize the existing human population and ecosystem components (e.g., aquatic and terrestrial communities) and to identify associated potential human and wildlife receptors within the vicinity of the facility. These steps included a literature review and field reconnaissance survey. A synopsis of the prevailing local human demographics and ecology was prepared to present an overview of the pertinent systems, as well as the identification of potential receptors, sensitive natural areas and/or threatened or endangered species.

Potential human receptors were identified based on the ease of public access to the facility and the specific uses of the surrounding resources such as the Delaware River and Red Lion Creek. Information regarding local land use and designated resource uses (e.g., surface water recreation and ground water use) was obtained from local planning documents and existing site assessments. Demographic information about the age and size of the population in and around Delaware City was obtained from existing project plans and the U.S. Census Bureau.

A habitat covertype map of the facility was prepared to characterize existing habitats of potential ecological receptors at the facility. The habitat covertype map was made utilizing the current facility base map and aerial photographs. The aerial photographs were obtained from the Soil Conservation Service (dated April 1989) and DNREC (dated 22 March 1988 and entitled State of Delaware Wetlands, New Castle County, Delaware). General habitats were identified on the base map and verified during the field reconnaissance survey conducted on 26 October 1993. Observations made during the field survey to describe each habitat covertype included: the species and general classification of vegetation, the dominant plant species present, the relative size of the covertype, and the presence of wildlife. The covertype assessment focused on the undeveloped portions of the facility boundary which included the area east of Route 9 to the Delaware River and south of Red Lion Creek to the developed portion of the facility. In addition, literature and aerial photographs were reviewed to identify changes in the regional ecology of the area and past land uses.

Information regarding state critical habitats and threatened and endangered species within the vicinity of the OxyChem Facility was obtained from a review of the Delaware Natural Heritage Inventory database. The database review was conducted by DNREC's Division of Fish and Wildlife and Division of Parks and Recreation. In addition, the U.S. Department of the Interior, Fish and Wildlife Service (USFWS) was contacted for information regarding federal threatened and endangered species. The results gathered from these data searches were used, in part, to determine potential receptors at the site.

2.1.11.2 *Selection of Constituents of Potential Concern for Humans*

The need to perform a corrective measures study is based on the prediction of an unacceptable risk to a potential receptor from exposure to a hazard. Once a potential receptor has been identified, it is important to identify which chemical constituents can, under certain circumstances, produce a hazard. To identify particular SWMUs and chemical constituents which require additional investigation in Phase II, analytical data collected during the Phase I RFI were compared to media-specific action levels. This evaluation will allow later Phases of the RFI to be focused on a specific suite of constituents within a particular SWMU, rather than on an extensive set of unnecessary parameters in each SWMU. Potential action levels for soil and ground water for human and ecological receptors included, as appropriate, the following: background levels, direct screening levels (DSLs), leachate screening levels (LSLs), Maximum Contaminant Levels (MCLs), Ambient Water Quality Criteria, and lowest observed effect levels.

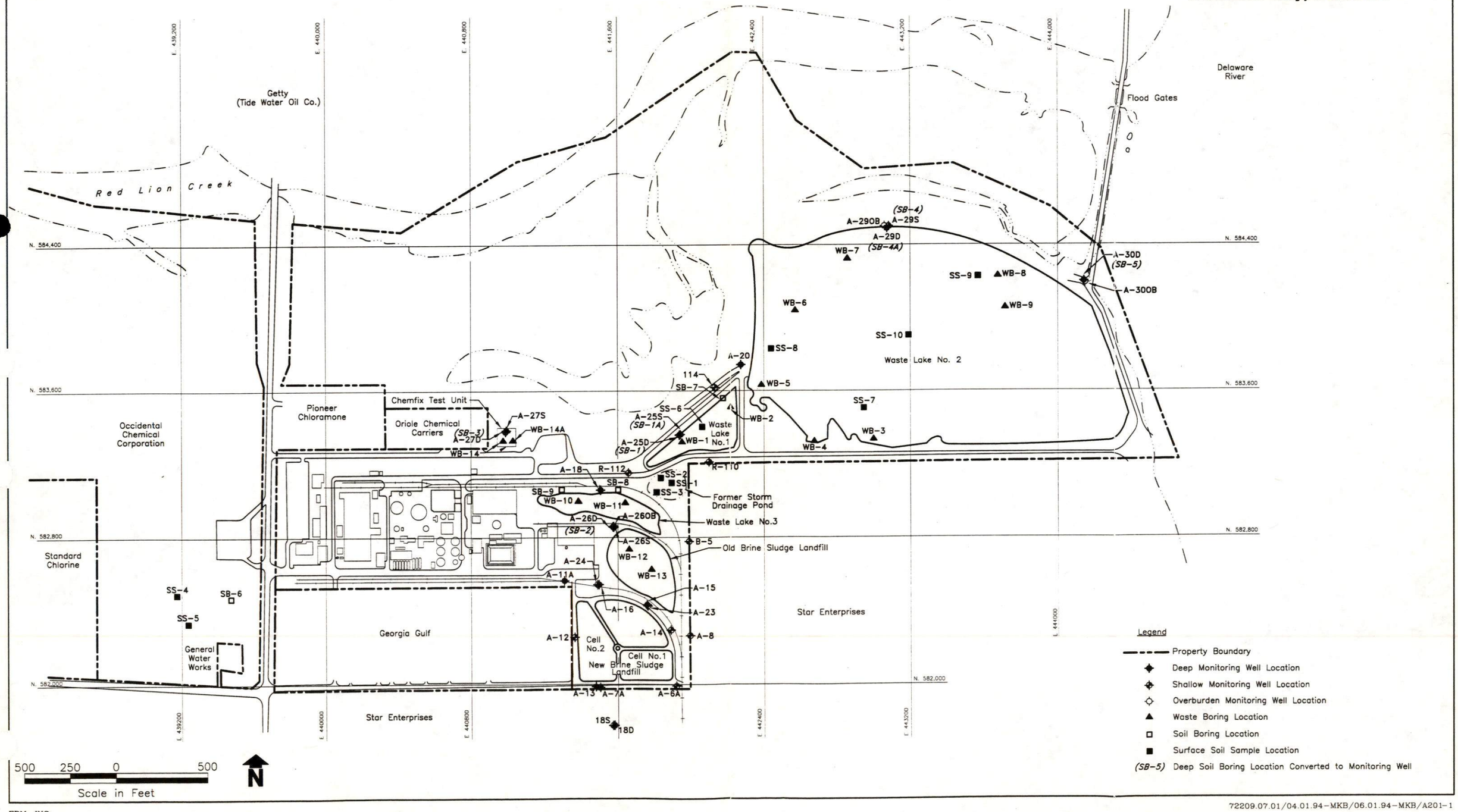
As part of the human health assessment, soil and ground water constituents were initially compared with the range of concentrations detected in background samples. For soil, constituent concentrations greater than the background distribution were then compared to Direct Screening Levels (DSLs) and Leaching Screening Levels (LSLs). Constituent concentrations which exceeded either level will be further evaluated in the Phase II RFI. For ground water, if a constituent was present at a concentration less than background, it will be deleted from future analyses. If a constituent was present at a level greater than the background concentration, then a comparison was made to MCLs where available, or to DSLs. Constituents that exceeded either the MCLs or DSLs will be further evaluated in subsequent phases of the RFI.

Direct Screening Levels (DSLs) were calculated for both soil and ground water following the guidance of the USEPA Region III Regional Toxicologist. These screening levels utilize standard default assumptions regarding exposure frequency, duration and extent. This information was integrated with current toxicity data to establish conservative estimates of acceptable chemical concentrations. The screening levels represent concentrations that would not yield an unacceptable level of risk to a receptor for the applicable route of exposure. Screening levels for sediment and surface water will be selected in Phase II when sampling is performed in Red Lion Creek.

For the ecological assessment, soil constituents were compared to background concentrations as a preliminary screening effort. Further screening will be conducted after a toxicity assessment is conducted during Phase II. For ground water, the worst-case scenario was evaluated by assuming that ground water would be discharging directly into Red Lion Creek and other floodplain open water areas without dilution, and that ecological receptors would be exposed to these undiluted concentrations. Thus, ground water constituents were first compared to the available federal and state Ambient Water Quality Criteria (AWQC) and to readily available Lowest Observed Effect Levels (LOEL) found in the USEPA Quality Criteria for Water 1986. If AWQC or LOELs were not available, then the constituents were compared to background concentrations. Constituent concentrations which exceeded the above action levels were determined to be preliminary constituents of concern and will be further evaluated during Phases II and III of the RFI.

Section 2 Figures

Figure 2-1
Sample Location Map for Phase I Investigation Activities
Occidental Chemical Corporation
Delaware City, Delaware



Section 3

3.0 INVESTIGATION RESULTS

3.1 ORGANIZATION OF RESULTS

This section is a compilation of data and information obtained from the Phase I RFI field activities. The subsections provide the following information:

- Sections 3.2 and 3.3 present descriptions of the site geology and hydrogeology.
- Section 3.4, Characterization of SWMUs, presents the analytical results of the samples collected at each SWMU during the RFI.
- Sections 3.5 and 3.6 present information on potential human and ecological impacts from related constituents.

3.2 SITE GEOLOGY

The geology beneath the facility is comprised mainly of Recent Deposits, the Columbia Formation, and the Potomac Formation. The Merchantville and the Magothy Formations are only present on the eastern portion of the site beneath WL-2. Geologic cross-sections created from the drilling logs are presented in Figure 3-1. The drilling logs of the waste borings, soil borings, and monitoring wells are presented in Appendix A.

The Recent Deposits consist of interbedded brown to gray sands, silt, peat and clay. Within this unit is a definable clayey silt layer as shown on Figure 3-1, section B-B1. It consists of a gray clayey silt with a trace of sand and gravel. It thickens from five feet to approximately 30 feet from south to north along this section line. It appears to end abruptly along the plant's northern access road in association with the topographical drop from the site to the adjacent estuary.

These deposits also include fill soil used by OxyChem to close the former waste disposal facilities (i.e. WL-2). Thicknesses of the Recent Deposits increase from west (9 feet) to east (29 feet) along Cross Section A - A' and from south (14 feet) to north (35 feet) along Cross Section B - B'.

The Columbia Formation consists of orange-brown, medium to coarse sand with occasional layers of silt. The well logs and cross sections indicate the Columbia Formation is approximately 55 feet thick at the

southern and western portions of the investigation area and thins eastward toward the Delaware River. According to well logs from Wells A-29D (SB-4A) and A-30D (SB-5), the Columbia Formation is only 10 feet thick at the north central boundary of WL-2, and is absent on the east side adjacent to the Delaware River. From the NBSL on the south side of the site to WL-3 in central portion of the site, the Columbia Formation gradually thins from 52 feet thick to 36 feet thick.

The Potomac formation underlies the Columbia formation in most places beneath the facility and consists of red, gray, and white clays. Previous investigations have determined that the Upper Potomac clays are approximately 100 feet thick.

At WL-2, the Merchantville and Magothy Formations are present between the Columbia and Potomac Formations. The Merchantville Formation consists of gray silt and peat and is approximately 25 feet thick at Well Nest A-30 and thins to 17 feet at Well Nest A-29. The Merchantville appears to thin toward the west and is not present at Well A-20. The Magothy Formation beneath the investigation area consists of gray to light brown medium to fine silty sand alternating with dark gray silt. The sand portion of the Magothy is 15 feet thick at Well Nest A-30 and thins to approximately 7 feet at Well Nest A-29. The silt portion of the Magothy Formation is only present at Well Nest A-29. It is 7 feet thick and pinches out to the east and west of Well Nest A-29.

3.3 *SITE HYDROGEOLOGY*

Based on field observations, previous investigations, and ground water elevation data, the Columbia Aquifer, Potomac Aquifer, and a discontinuous perched water table underlie the facility. The clays of the Upper Potomac Formation act as a confining layer between the Columbia and Potomac aquifers. The silts and clays of the Recent Deposits act as local aquitards in some areas of the facility.

The ground water elevation data collected during the RFI indicate that the depth to ground water ranges from 0.50 to 18 feet below ground surface. A summary of the monthly ground water elevations is presented in Table 3-1. The ground water flow direction in the Columbia Aquifer is to the north towards Red Lion Creek. Figure 3-2 presents an example ground water elevation map in the Columbia Aquifer for 13 December 1993. Ground water elevation maps for each monthly measurement event are presented in Appendix B. The ground water gradient generally mimics the topographical gradient. The highest ground water elevations are

located beneath the NBSL. Although the water levels change slightly from month to month, the shape of the ground water surface remains essentially unchanged.

The water level data indicate that a ground water divide is present along the southern property boundary between OxyChem and Star. The ground water elevations in OxyChem Wells A-13 and A-7A are higher than the ground water elevations at Star Wells 18D and 18S indicating flow to the south from OxyChem to Star. The Star wells were intended to serve as water quality data points upgradient of the facility. Although, these wells are not upgradient, they do provide background, ground water quality data in the shallow and deep portions of the Columbia Aquifer as they are proximal to the ground water divide and represent ground water conditions that are unaffected by the OxyChem facility.

Horizontal and vertical gradients in the Columbia Aquifer at the facility are low. The horizontal gradient is 0.003. Table 3-2 presents the head difference between the shallow and deep wells screened in the Columbia aquifer. Negative values indicate a lower water level in the shallow well and an upward ground water flow. Positive values are indicative of downward flow. Overall, the head differences were within 0.1 feet between the shallow and the deep wells. Head differences this small indicate that the water levels are essentially equal, and the vertical gradient is very small resulting in predominately lateral flow toward Red Lion Creek.

A perched water table condition is present at the OBSL and WL-2. There was a silt, peat, and clay layer present with hydraulic conductivity (K) values low enough (0.001 ft/day) to sustain a perched water system. The perched system at the OBSL may extend further to the north, but it is not known how far east and west this system extends. Shallow water was encountered in the waste and soil borings of WL-3, which is directly north and down gradient of the OBSL. However, shallow water was not encountered in the waste and soil borings of WL-1, which is located between WL-3 and WL-2.

When comparing the head differences between the perched systems and the shallow Columbia, the perched system in the OBSL has a steep downward gradient. Head difference between the wells is approximately 13 feet (Table 3-2). At WL-2 the head differences between the perched system and the shallow Columbia is very small. The vertical gradient resembles those observed between the shallow and deep Columbia wells.

Slug Test Results

The results of the slug tests showed the hydraulic conductivity values in the Upper Columbia Aquifer were between approximately 0.04 ft/day in Well R-110 and 100 ft/day in Wells A-14 and A-27S. The hydraulic conductivity values in the Lower Columbia Aquifer were between approximately 34 ft/day in Well A-20 and 472 ft/day in Well A-11A. The hydraulic conductivity of the Magothy Formation was approximately 8 ft/day in Well A-30D. The hydraulic conductivity values in the perched aquifer were approximately 0.01 ft/day in all wells tested. Hydraulic conductivity values for all the wells that were slug tested are provided in Table 3-3. Figures 3-3 and 3-4 presents example data plots and the type curves used in the analysis. Data plots and calculation sheets for each well tested are presented in Appendix C.

To estimate a ground water flow velocity, the values of hydraulic conductivity (K), effective porosity (n_e), and the hydraulic gradient (i) have been used. An average K value of 94 ft/day was calculated from the slug tests. The hydraulic gradient is calculated from the vertical change in the ground water elevation over distance. The gradient for the investigation area is estimated to be 0.003 (feet/foot). The effective porosity was assumed to be 30 percent (0.30) based on soil type and typical porosity values.

The ground water flow velocity has been calculated using the following equation:

$$V = K i / n_e$$

The average ground water flow velocity at the facility is approximately 1 ft/day.

Tidal Survey Results

A 24-hour tidal monitoring program was performed to study the influences, if any, of the Delaware River tidal fluctuations on site ground water gradients and flow directions. This study included 24-hour continuous monitoring of water levels in selected wells distributed throughout the site. The wells used in this study include Wells A-30D, A-30OB, A-29D, A-29S, A-29OB, 114, A-20, A-27D, A-27S, A-26D, A-26S, A-13, A-7A, and a stilling well in the Delaware River. Two monitoring events were performed (i.e., new moon and full moon phases) to assess whether tidal influences are present. Both tidal surveys were conducted during January 1994. The new moon survey was conducted on 11 and 12

January 1994; and the full moon survey was conducted on 27 and 28 January 1994.

Both tidal surveys showed that only deep Well A-30D, located adjacent to the river, was influenced by the tidal fluctuations of the Delaware River. The tidal fluctuations observed in this well does not alter the ground water gradient or flow direction at the facility. Example data plots are presented in Figure 3-5. The graph at the top shows the data plot of the Delaware River which is subject to tidal fluctuations, the middle graph shows the data plot of Well A-30D which is tidally influenced, and the bottom graph shows the data plot of Well A-13 which is not tidally influenced. All data plots from both tidal surveys are presented in Appendix E.

Evaluation of Potomac Aquifer

As per EPA's request, OxyChem has obtained and evaluated existing hydrogeologic data pertaining to the Potomac Formation as part of the Phase I RFI. These data have been reviewed to assess the potential for interconnection between the Columbia and Potomac Aquifers. This assessment has included the review of previous studies conducted at the facility and Standard Chlorine. No additional subsurface investigations have been performed during the RFI to supplement the existing Potomac Aquifer data. The purpose for this assessment is to consider whether degradation of the Potomac Aquifer could result from constituent releases at the facility, and determine if supplemental phases of the RFI should include investigation of the Potomac Formation.

This assessment is based on the following existing documents from which field data, geological logs, and professional conclusions have been reviewed:

- Hydrogeologic Evaluation, Brine Sludge Disposal Facility, Diamond Shamrock Company; Duffield Associates, Inc.; September 1983.
- Hydrogeologic Evaluation, Aquifer Connection Study, Diamond Shamrock Company; Woodward Clyde Consultants; December 1983.
- Remedial Investigation Report for the Standard Chlorine of Delaware, Inc. Site; Roy F. Weston, Inc.; September 1992.

Each of these studies has characterized the geology beneath the OxyChem and Standard Chlorine properties as being a complex section of the Atlantic Coastal Plain consisting of approximately 700 feet of sedimentary deposits overlying the basement rock. The studies have shown that beneath certain areas of the OxyChem and Standard Chlorine facilities,

various Upper Cretaceous age geological formations have been incised, which are generally observed between the Columbia and Potomac Formations (e.g., Merchantville, Magothy, etc.).

Beneath the disposal impoundments area at the facility, the Columbia Formation directly overlies the Potomac Formation where the Merchantville and Magothy Formations have been incised creating a natural valley which has been filled by Columbia Aquifer sediments. The existence of this natural valley beneath the impoundment area was best presented by Duffield Associates, Inc. through the development of a geologic structural map of the base of the Columbia Aquifer (see Figure 6, Task I, Description of Current Conditions Report). This map was developed using boring log data from all previous facility investigations. The studies have shown that even where the Columbia Formation is in contact with the Potomac Formation, the Upper Hydrologic Zone (UHZ) of the Potomac Aquifer remains separated from the Columbia Aquifer by more than 100 feet of low-permeability Potomac Formation silts and clays.

The Woodward Clyde Consultant's (WCC) study included a three-day pump test on the Potomac Aquifer to assess the potential for vertical connection between the Columbia and Potomac Aquifers at the OxyChem facility. The test was performed by pumping Potomac Wells A-17, A-19, and A-21, and measuring the effects on Columbia Aquifer Wells A-12, A-16, A-11, B-5, A-18, 112, A-20, 113, and 114.

During the pump test, the wells screened in the Columbia Aquifer, showed no significant drawdowns that could be related to pumping of the Potomac Aquifer. It was concluded by WCC that there was no vertical connection between the aquifers. Incidental to this conclusion, WCC noted that on the last day of the pump test there was a drop of 0.05 feet in virtually all of the Columbia Aquifer wells. However, this drop was determined by WCC not to be related to the pump test, as the slight decrease in water levels was observed equally at each well, with no preference for greater decreases at the wells closest in lateral proximity to the pumping wells. Upon review of the methods used to conduct the pump test and the test results, ERM agrees with the interpretation provided by WCC. The 0.05 foot decrease is within the range of fluctuation observed in the wells prior to the pump test, and is approximately equivalent to the accuracy with which the depth to water measurements could be made using a sounding tape, which was the method of measurement employed.

Another pump test, similar to the one performed by WCC, was performed by Roy F. Weston, Inc. (Weston) in October 1990 as part of a remedial

investigation of the Standard Chlorine facility. Geological and Hydrogeological conditions at the Standard Chlorine facility are reported to be similar to those at the OxyChem facility in that beneath portions of the facility, the Columbia Formation unconformably overlies the Potomac Formation. The pump test at the Standard Chlorine facility was conducted to evaluate whether the Columbia Aquifer was hydraulically connected to the Upper Hydrologic Zone (UHZ) of the Potomac Formation. The Standard Chlorine pump test was performed by pumping an inactive Star production well (Well OR6A), which is located near the Standard Chlorine facility on Star property. This well is screened in the UHZ of the Potomac Formation, and is located upstream along Red Lion Creek approximately 5000 feet from the OxyChem impoundments area.

Well OR6A was pumped at a rate of approximately 410 gpm for 74 hours with water level data collected from 37 observation wells. Pressure transducers were used in 11 of the observation wells to continuously measure water level fluctuations during the pumping test. Water level responses to pumping were observed in Wells OR6B, MW-11, and MW-12, which are screened in the UHZ of the Potomac Formation. The drawdown at Well OR6B, which is approximately 100 feet from the pumping well, was greater than 20 feet. The drawdowns at Wells MW-11 and MW-12, which are both more than 2000 feet from the pumping well, were 7 and 4 feet, respectively. As seen from the observed drawdowns in these wells, the pump test significantly stressed the UHZ such that any discontinuity in the confining unit between the Columbia Aquifer and UHZ could have been identified within the study area.

Through continuous monitoring of the Columbia Aquifer during the pump test, the wells screened in this aquifer generally showed a rise in the water level. The only exception to this trend was at Well TW-28, which showed a dropping water level prior to the beginning of the pump test, during the test, and after pumping had ceased. There was no observed change in the slope of the hydrograph for this well during pumping, which might have indicated an impact due to pumping of the deeper aquifer if there were interconnection between the aquifers. The decrease in water level at this well was attributed to the dissipation of a local ground water mound caused by rainwater recharge at the ground surface. In summary, no Columbia Aquifer wells exhibited a decline in water levels in response to the pump test. Further analysis of the pump test results showed that the plotted drawdown data for the UHZ closely matched the Thesis type-curve for a confined, non-leaking, aquifer system over the testing period. The Standard Chlorine report concluded that the low-permeability of the confining silts and clays of the upper Potomac Formation significantly restricts the potential for vertical migration of

ground water, and that direct hydraulic connection between the Columbia Aquifer and UHZ of the Potomac Formation does not appear to exist in the study area.

Based on the results of the pump tests described herein for the OxyChem property and the Standard Chlorine facility, it is ERM's opinion that the information presented previously in the Task I, Description of Current Conditions Report is correct. The upper Potomac Formation silts and clays, with the Merchantville and Magothy Formations where present, independently or collectively serve as an aquitard, which significantly restricts the vertical migration of constituents from the Columbia Aquifer to the Potomac Aquifer. Because ground water in the Columbia Aquifer flows preferentially along horizontal paths toward Red Lion Creek, virtually no vertical movement of ground water appears to exist between the Columbia Aquifer and the UHZ of the Potomac Formation in the vicinity of the facility. Based on these results, OxyChem and ERM do not believe that further evaluation of the Potomac Aquifer is warranted under this RFI.

3.4 *CHARACTERIZATION OF SWMUS*

The SWMUs were characterized using the sample analytical results obtained from the laboratory. All samples were screened in the field using a Century Organic Vapor Analyzer (OVA). Additionally, samples from all the soil borings and the waste boring samples from WL-2 were screened using the ERM FAST® (FAST) mobile analysis equipment. These samples were screened for organic constituents using gas chromatography/mass spectroscopy (GC/MS) methods and inorganic constituents using X-ray fluorescent (XRF) methods. The FAST results were only used for sample screening to select samples for submittal to the laboratory. The samples with the highest readings were selected for shipment to the laboratory. The results of the FAST GC/MS and XRF analyses (Appendix H) were not used to characterize the SWMUs.

In order to determine the potential impact of site-related constituents, the analytical data from the SWMUs are compared with data collected from background samples. These samples were collected in areas that were not affected by facility activities.

The SWMU characterization lists each SWMU separately and discusses the analytical results of each media-type sampled (i.e., surface soil, waste, etc.). Constituent concentrations detected in the media-types are discussed in the following order: VOC, SVOC, and Metals.

3.4.1 *Background Conditions*

The background soil conditions were characterized by two surface soil samples (SS-4 and SS-5) and three subsurface samples from Boring (SB-6). The subsurface samples included soil from 2-foot intervals at 2, 8, and 15 feet below ground surface (BGS). These samples were collected from OxyChem's recreation area located approximately 800 feet west of the facility's main gate. Since this area consists of undisturbed soil and sedimentary deposits close to the facility, it is suitable for characterizing background conditions.

No organic constituents were detected in Surface Soil Samples SS-4 and SS-5 and the subsurface samples. According to Schaklette and Boerngen (1984), who conducted studies on typical concentrations of inorganics in eastern U.S. soils, concentrations of inorganic constituents including site related constituents (mercury, barium, cadmium) were consistent with regional concentrations. Table 3-4 presents the analytical results from the background samples.

Background ground water conditions were characterized by two wells located on the Star Enterprise (Star) property adjacent to the NBSL. These Wells (Star-18S and Star-18D) are located approximately 400 feet south of the facility property boundary. As mentioned in Section 3.3, these wells are in an adjacent but separate hydrogeologic flow system from the OxyChem facility. The absence of facility-related constituents such as mercury and barium in Wells Star-18S and Star-18D show that these wells are not impacted by facility activities and are suitable for background purposes. Analytical results show that no organic constituents were detected in Wells Star-18S and Star-18D, and the only metal constituents detected in these wells were manganese, sodium, and zinc.

3.4.2 *Waste Lake No. 1*

WL-1 was characterized by one surface soil sample (SS-6), six subsurface waste samples from two borings (WB-1 and WB-2), eight subsurface soil samples from three soil borings (SB-1, SB-1A and SB-7), and five ground water samples from Wells A-25S, A-25D, 114, A-20, and R-110. With the exception of soil sample SS-6, which showed no site related constituents, elevated concentrations of VOCs such as chlorobenzene, SVOCs such as 1,4 Dichlorobenzene (1,4-DCBZ), and inorganic constituents such as mercury were detected. Table 3-5 presents the analytical data from samples collected for the characterization of WL-1. Figures 3-6 and 3-7 present the distribution of certain key constituents (i.e., Total VOCs, Total SVOCs and mercury) observed in the samples collected at WL-1.

Surface Soil

In the Surface Soil sample, SS-6, there were no organic constituents detected. The concentrations of inorganic constituents in this sample are within background levels.

Waste

The highest total VOC concentrations were present in the WL-1 waste boring samples. Total VOC concentrations range from 900 µg/Kg to 5,200,000 µg/Kg. Chlorobenzene comprised 84 percent of the total VOC concentrations from the waste boring samples. Chlorobenzene concentrations range from non-detected to 3,400,000 µg/Kg. The other VOCs detected at elevated concentrations include benzene (1,800,000 µg/Kg, WB-1) and vinyl chloride (90,000 µg/Kg, WB-2). Overall the concentrations of total VOCs increased with depth. The highest concentrations of VOCs were detected in Boring WB-1.

The highest concentrations of SVOCs were detected in the waste boring samples, and in particular Boring WB-1. Dichlorobenzenes (DCBZs) comprised over 90 percent of the SVOCs detected. The SVOC 1,4-DCBZ was the most prevalent DCBZ compound detected with concentrations ranging from 10,000 µg/Kg to 9,500,000 µg/Kg. Concentrations of 1,2 DCBZ were similar to the 1,4-DCBZ values, and the 1,3-DCBZ concentrations were generally an order of magnitude less. Other SVOCs detected in the waste borings include 1,2,4-Trichlorobenzene. Concentrations range from 3,700 µg/Kg to 300,000 µg/Kg. Overall, the concentrations of SVOCs increased with depth.

Mercury concentrations in the waste borings range from 1300 mg/Kg to 42,000 mg/Kg with concentrations decreasing with depth. The highest mercury concentrations were detected in samples from Boring WB-2. barium concentrations range from 2400 mg/Kg to 8700 mg/Kg with concentrations generally increasing with depth. Other metals detected at lower concentrations in the waste borings include cadmium (6.9 mg/Kg), chromium (1300, mg/Kg), and lead (220 mg/Kg). All of these constituents decrease in concentration with depth.

Toxicity Characteristics Leaching Procedure (TCLP) results for waste boring samples indicate that benzene exceeded its regulatory limit of 0.5 mg/L in samples from WB-1 (69 mg/L) and WB-2 (2.4 mg/L). The SVOC 1,4-DCBZ also exceeded its regulatory limit of 7.5 mg/L in the sample from WB-1 (18 mg/L). This compound was also detected in the WB-2 sample, but below the regulatory limit. Chlorobenzene, barium, mercury,

and chromium were also detected in the waste samples, but at concentrations below the regulatory limits for these analytes.

Subsurface Soil

Subsurface soil data from samples collected below the berm of WL-1 contained total VOC concentrations four orders of magnitude lower than the concentrations in the waste boring samples. Benzene and chlorobenzene comprised more than 90 percent of the total VOC concentrations. Total VOC concentrations range between 2.8 µg/Kg and 42.9 µg/Kg in samples collected from Borings SB-1 and SB-7, respectively. However, a single sample (SB-1A [20'-22']) collected during the drilling of Well A-25S, had VOC concentrations three orders of magnitude higher than the other samples. The concentration of benzene was 25,000 µg/Kg, and the concentration of chlorobenzene was 1400 µg/Kg. Other VOCs detected in this sample included vinyl chloride (1700 µg/Kg) and 2-chlorovinylether (59 µg/Kg).

The concentration of SVOCs in the soil boring samples were considerably lower when compared to the concentrations in the waste boring samples. Approximately 93 percent of the SVOCs detected were DCBZs. The SVOC 1,4-DCBZ had the highest concentrations of the DCBZ compounds with concentrations averaging 4200 µg/Kg. SVOCs were only detected in Borings SB-1 and SB-1A at the 20 to 22 foot interval.

The concentrations of mercury, barium, and other metals detected in the soil boring samples and surface soil samples were comparable to background concentrations.

Ground Water

Ground water samples from WL-1 exhibited the same constituent distribution as the waste and soil samples. Chlorobenzene is again present as the principal VOC. Elevated concentrations of benzene were also detected. The upgradient concentration of chlorobenzene in Well R-110 was 170 µg/L. Chlorobenzene concentrations in downgradient wells range from 250 µg/L to 170,000 µg/L. Benzene concentrations range from 96 µg/L to 62,000 µg/L. The concentrations of VOCs at Well Nest A-25 show higher concentrations in the shallow well. There is a similar trend when comparing the VOC concentrations of Well 114, a shallow well, to Well A-20, a deep well close to Well 114.

DCBZs comprise over 90 percent of the SVOCs detected in the wells around WL-1. The most prevalent compound, 1,4-DCBZ , is present at

concentrations that range from 170 µg/L to 22,000 µg/L. The shallow and deep well pairs mentioned above had essentially identical SVOC concentrations.

Dissolved metals are present at concentrations several orders of magnitude lower than the organics. Dissolved mercury is present in the background well at a concentration of 4.8 µg/L. Downgradient concentrations range from non-detected in Well A-20 to 64 µg/L in Well 114. In Well Nest A-25, the dissolved mercury concentrations were highest in the deep well, A-25D (15.2 µg/L). Dissolved barium was only detected in Well A-20 at a concentration of 317 µg/L.

Dissolved metal concentrations were used in the evaluation because dissolved metals are more mobile and, therefore, more conservative. They are also more likely to be transmitted to potential receptors. Metals bonding with individual sediment grains may be transported very slowly downgradient, and are not as likely to be consumed by receptors. The total metal concentrations were not evaluated but were presented in the report for comparison purposes only.

According to EPA Region III *Draft Guidance on Selecting Analytical Metal results from Monitoring Well Samples for the Quantitative Assessment of Risk* (10 October 1992), dissolved metals should be used to characterize the site if there is a notable disparity between the total and dissolved concentrations of aluminum, iron and manganese. Approximately 50 percent of the Phase I ground water sample data showed a notable disparity between total and dissolved concentrations of these three metals. According to a 1 October 1993 memorandum from Martha G. Prothro of EPA's Office of Waste..."any error incurred from excluding particulate metal will generally be compensated by other factors which make criteria conservative."

Standard Chlorine Effluent Line Soil Gas Survey

Since WL-1 received waste water from the Standard Chlorine effluent line, the discussion of the soil gas survey results are included in this section. Soil gas samples were collected and analyzed from 66 sampling locations along the Standard Chlorine effluent line. Figures 3-8 and 3-9 present a sample location map of the soil gas survey.

OVA readings did not indicate the presence of significant concentrations of VOCs at any sample locations. Low ppb concentrations of benzene, toluene and xylene (BTX) were detected by the GC in the soil gas samples at 12 locations during the survey. The soil at these locations did not

exhibit residual contamination as evidenced by the lack of obvious staining or odors. Based upon OVA screening results and field observation of soil conditions, no potential soil source areas were identified. Accordingly, no additional investigation was performed.

The Work Plan called for the soil gas probes to be advanced to a depth of 4 feet below surface. In the field, difficult soil conditions limited probe advancement to from 1.5 to 3 feet below surface. Observation of the materials brought to the surface by the hand-operated, power auger revealed that the soil was consistent with the surficial materials encountered elsewhere at the plant and included gravely fill materials and dry, native, light brown, sandy silt materials. These soil types are favorable however to vapor migration within the vadose zone. Surface conditions varied from grass covered to asphalt covered, and in the area near the guard house (SG-45 through SG-51) soils were more densely packed. No strong odors or obvious soil staining were noted in any of the borings.

Analysis of soil gas vapors indicate the presence of VOCs in the vicinity of the pipeline. The total peak or maximum OVA result and the total VOC value as detected by the GC are presented on Table 3-6.

Total peak and stabilized VOC readings ranged from 3 parts per million (ppm) to 460 ppm. At all sample points the stabilized values were greatly reduced from the initial peak value recorded. An elevated initial peak value followed by a greatly reduced stabilized value can be an indication of VOCs being stored in the vadose zone from a distant or low concentration source or an older source which has been degraded over time. An elevated peak value which is sustained can be an indication of close proximity to a high concentration VOC source area.

Gas chromatographic analysis of vapors sampled at the facility identified only three VOCs, benzene, toluene, and xylenes. Identification of these compounds was made based on retention time comparison of standard chromatograms to sample chromatograms. Several additional compounds were detected which were not identified.

Toluene was detected by the GC in sample points SG-2 at 36 ppb, SG-8 at 78 ppb, and SG-56 at 2 ppb as compared to the aqueous standard. Benzene was detected in sample points SG-44, 45, 46, 47, 50, 52, 56, 60, 64, and 65. Concentrations of benzene as compared to the aqueous standard ranged from 2 to 36 ppb. Xylene was detected in sample points SG-45 at 26 ppb, SG-46 at 3 ppb, SG- 47 at 7 ppb, and SG-52 at 2 ppb.

A series of light molecular weight compounds which could not be identified based on retention time comparison to the standards were detected in all sample locations. Concentrations of these unidentified compounds ranged from 6 ppb to 275 ppb as compared to the benzene response in the aqueous standard. The chromatographic pattern or "fingerprint" for these compounds was indicative of minimal to no separation by the analytical column. These compounds are typically seen by ERM during soil gas survey techniques in most organic rich soils and are likely the result of naturally occurring organic degradation products such as methane.

As part of the evaluation of the Standard Chlorine Pipeline, existing information was reviewed regarding its construction and history including Diamond Shamrock drawing No. 3FS 535-67A. The information provided details as to the line's construction and location. However, no meaningful understanding of its operating past was developed from the review to identify past leaks (potential source areas) and focus the investigation. OxyChem is unaware of any additional information regarding the line's operational or maintenance history.

As part of proposed Phase II characterization activities, additional source area characterization is planned for the central and western plant process area. The pipeline is adjacent to and immediately downgradient from the process area in this portion of the plant. Shallow wells installed to assess the process area will also in effect monitor the pipeline. If any impact to ground water above levels of concern are observed in these wells, whether from the process area or the pipeline, appropriate remedial measures will be implemented.

3.4.3 *Waste Lake No. 2*

3.4.3.1 *Geophysical Survey*

An electromagnetic conductivity (EM) survey was performed in WL-2 to obtain data to estimate the location and lateral extent of affected media within the survey area. In addition, the results of these surveys were used to select soil-boring and waste-boring locations at WL-2.

Figure 3-10 is a contour plot of the soil conductivity responses at the WL-2 location. This map suggests the presence of four anomalous areas that are associated with electrically-conductive materials in the subsurface. These areas are irregularly-shaped and are characterized by sharp increases in soil conductivity that are significantly higher than the observed background readings. It should be noted that high conductivity values do not necessarily indicate the presence of waste but, may represent areas where conductive constituents have been deposited in WL-2. Assuming

that the depth to conductive materials is similar, an increase in electrical conductivity would suggest an increase in the volume or concentration of conductive materials that are present within the waste area.

The primary criteria that was used to estimate the conductivity boundaries included an evaluation of the magnitude of the EM responses and the EM gradients. For the most part, both values were high at the boundary between unaffected deposits and deposits believed to contain highly-conductive constituents.

3.4.3.2 *WL-2 Characterization*

WL-2 was characterized by four surface soil samples (SS-7, SS-8, SS-9, and SS-10), 23 samples from seven waste borings (WB-3 through WB-9), eight samples from three soil borings (SB-4, SB-4A, and SB-5), and five ground water samples from Wells A-29S, A-29D, A-29OB, A-30D, and A-30OB. Table 3-7 presents the results from the samples collected from WL-2.

Many of the same constituents that were present in samples from WL-1 appear in the samples from WL-2 but at much lower concentrations. These constituents include: chlorobenzene, benzene, DCBZs, and mercury. Elevated levels of DCBZs were present in one of the surface soil samples. This was the only surface soil sample collected during the investigation in which organic constituents (VOCs and SVOCs) were detected. In addition, there were almost no detections of site related constituents in the ground water samples from WL-2. Figures 3-11 and 3-12 present the distribution of key constituents observed in the samples collected at WL-2.

Surface Soil

The Surface Soil Sample SS-8 contained total SVOCs at 750 µg/Kg. Fifty percent of the constituents were DCBZs with the other 50 percent being 1,2,4-Trichlorobenzene. Overall, metals concentrations in SS-8 and the other surface soil samples, SS-7, SS-9, and SS-10, were within background concentrations.

Waste/Soil

The waste boring samples intended for WL-2 were collected from similar depth intervals as the waste boring samples in WL-1. However, consistent with the operational history of WL-2, no discrete waste horizon was observed in the WL-2 waste borings. The waste/soil samples collected from WL-2 therefore represent the soils used as fill in the former waste

lake and subsurface soil that may have been affected by vertical migration of constituents during operation of WL-2. Chlorobenzene was the most prevalent VOC detected in the samples. Concentrations of VOCs ranged from non-detected (ND) in samples from WB-5 to 290,000 µg/Kg in Sample WB-6 (2 to 4 feet). Other VOCs detected in the WL-2 samples include: benzene (ND to 26,000 µg/Kg) and toluene (ND to 6 µg/Kg). The concentrations of VOCs in samples from Boring WB-6 were the highest of all the samples from this unit, ranging from 1 to 4 orders of magnitude higher than the other samples.

The DCBZ compounds are an indication of the SVOCs present in WL-2. Concentrations ranged from non detectable in samples from Borings WB-3 and WB-5 to 140,000 µg/Kg in Boring WB-6. As with the VOC compounds, the concentrations of SVOCs were highest in samples from Boring WB-6.

Mercury concentrations in the waste borings range from 3.2 mg/Kg to 270 mg/Kg with concentrations generally increasing with depth. The highest mercury concentrations were detected in samples from Boring WB-8. In samples from Borings WB-3, WB-5, WB-6, WB-8, and WB-9, concentrations of lead were one order of magnitude higher than background soil samples. Other metals were detected at concentrations comparable to the background soil concentrations.

Subsurface Soil

Low to moderate concentrations of VOCs were detected in samples from the soil borings, SB-4 and SB-5. Chlorobenzene was detected at 3.4 µg/Kg in a sample from Boring SB-4, and benzene was detected at 69 µg/Kg in a sample from Boring SB-5.

Metals concentrations of soil boring samples in WL-2 were within the same range of concentrations of the samples collected from the background soil boring, SB-6.

Ground Water

Essentially, no site related constituents were detected in the ground water downgradient of WL-2. The only organic constituent detected in the ground water samples was the VOC chloroform (3.3 µg/L) in Well A-29OB. Mercury was not detected in any of the ground water samples. Dissolved barium was detected in the samples at concentrations ranging from 253 µg/L in Well A-29S to 1230 µg/L in Well A-30D. The total barium concentrations were almost identical to the dissolved

concentrations, which indicates that most of the barium in the ground water at WL-2 was in the dissolved phase. Barium was not detected in either of the background ground water samples.

3.4.4 *Waste Lake No. 3*

WL-3 was characterized by six samples from two waste borings (WB-10 and WB-11), six samples from two soil borings (SB-8 and SB-9), and two ground water samples from Wells A-18 and R-112. Table 3-8 presents the results from the samples collected from WL-3.

Elevated concentrations of site related constituents were detected in the waste boring samples. No organic constituents (VOCs and SVOCs) were detected in the soil boring samples, and the only trace concentrations were present in the ground water. Figures 3-13 and 3-14 present the distribution of key constituents observed in the samples collected at WL-3.

Waste

Vinyl chloride was present in the waste boring samples at concentrations ranging from 1000 µg/Kg in a sample from WB-10 to 2,900,000 µg/Kg in a sample from WB-11. Most of the concentrations detected were between 1000 µg/Kg and 2400 µg/Kg. Chloroethane was also detected at an elevated concentration (2100 mg/Kg) in a sample from WB-10. Benzene and chlorobenzene were detected at low concentrations (33 to 70 µg/Kg) in samples from WB-10.

SVOCs were only detected in samples from Boring WB-10. The SVOC, bis(2-ethylhexyl)phthalate (B2EHP), was detected at a concentration of 430,000 µg/Kg. Although B2EHP can be a common laboratory contaminant, its occurrence at significant concentrations in the waste samples indicates the likely presence of this compound. Other SVOCs detected in samples from Boring WB-10 include: benzo(ghi)perylene (45,000 µg/Kg), dibenzo(a,h)anthracene (36,000 µg/Kg), and indeno(1,2,3-cd) pyrene (36,000 µg/Kg).

Mercury and lead were the only metals detected at elevated concentrations in the waste boring samples. Concentrations of mercury ranged from 0.42 mg/Kg to 1400 mg/Kg, both in samples from Boring WB-10. The highest mercury concentration detected in samples from Boring WB-11 was 17 mg/Kg. Lead was detected at a concentration of 580 mg/Kg in a sample from Boring WB-10. Lead concentrations in the samples from WB-11 ranged from 4.8 mg/Kg to 28 mg/Kg. No other

metals were detected at significant concentrations in the samples from the WL-3 waste borings.

Chromium was detected in the TCLP analysis from a sample collected from Boring WB-10. The concentration of 0.038 mg/L was below the regulatory limit of 5 mg/L. This was the only analyte detected in the TCLP analysis for this SWMU.

Subsurface Soil

There were no organic constituents detected in the soil boring samples from Borings SB-8 and SB-9, and the concentrations of metals were within the background concentrations detected in the samples from Boring SB-6.

Ground Water

Well R-112 was the only well down gradient of WL-3 in which organic constituents (VOCs and SVOCs) were detected. Low concentrations of chlorobenzene (15 µg/L) and DCBZs (3.5 to 4.6 µg/L) were detected in Well R-112. However, this well is located close to WL-1 and may be affected by radial migration. No organic constituents were detected in the immediately downgradient Well A-18.

There were no concentrations of dissolved or total metals detected above background concentrations in the ground water samples from Wells A-18 and R-112. Site related constituents such as mercury and barium were not detected.

3.4.5 *Old Brine Sludge Landfill*

The OBSL was characterized by five samples from two waste borings (WB-12 and WB-13), three samples from one soil boring (SB-2), and four ground water samples from Wells B-5, A-26S, A-26OB, and A-26D. The A-26 wells were analyzed only for metals and wet chemistry parameters per the RFI Work Plan, as only these parameters were believed to exist in the OBSL. The waste and soil boring samples included material from 2-foot intervals ranging from 2 to 17 feet. Table 3-9 presents the results from the samples collected at the OBSL.

Elevated concentrations of organic constituents were detected in samples from the waste borings in the OBSL. No organic constituents were detected in the one soil boring, analyzed for these parameters (SB-2 10 to 12 foot), or the ground water sample from Well B-5. Only trace concentrations of inorganic constituents were detected in the ground

water samples. Figures 3-15 and 3-16 present the distribution of key constituents observed in samples collected from the OBSL.

Waste

Vinyl chloride was detected in the samples from the waste borings, at concentrations ranging from 8800 µg/Kg to 29,000 µg/Kg. Other organic constituents detected in the waste boring samples include chloroform (up to 890 µg/Kg) and tetrachloroethene (PCE) (up to 800 µg/Kg).

The compound B2EHP was also detected at elevated concentrations in the waste boring samples from the OBSL. Concentrations range from 110,000 µg/Kg to 930,000 µg/Kg. This was the only SVOC detected in the waste boring samples from the OBSL.

Elevated concentrations of mercury and barium were detected in the waste boring samples in the OBSL. The mercury concentrations range from 210 mg/Kg in the WB-13, 6 to 8-foot sample to 4400 mg/Kg in the WB-13, 4 to 6-foot sample. The barium concentrations range up to 78 mg/Kg in the WB-12, 8 to 10-foot sample.

TCLP results indicate that benzene exceeded its regulatory limit of 0.2 mg/L in the sample from WB-13 (0.27 mg/L). Methyl ethyl ketone (0.14 mg/L) and lead (0.457 mg/L) were also detected in the WB-13 sample but below the regulatory limits.

Subsurface Soils

No organic constituents were detected in the soil boring samples, and most of the metals concentrations were within background concentrations detected in samples from Boring SB-6. The mercury concentration in the 2 to 4-foot sample from SB-2 (35.5 mg/Kg) was an order of magnitude above background.

Ground Water

There were no organic constituents detected in the ground water sample from Well B-5, which was analyzed for VOCs and SVOCs primarily to assess ground water conditions that may be migrating from Star property toward the west beneath the OxyChem Site. In addition, there were no significant concentrations of dissolved metals detected in the ground water. Dissolved mercury was not detected in any of the ground water samples from the OBSL, but total mercury was detected in Well A-26D at a low concentration of 0.24 µg/L.

3.4.6 *New Brine Sludge Landfill*

The NBSL was characterized by eleven ground water samples from Wells A-6A, A7A, A-8, A-11A, A-12, A-13, A-14, A-15, A-16, A-23, and A-24. Table 3-10 presents the results from the samples collected from the NBSL.

No organic constituents (VOCs and SVOCs) were detected in Wells A-6A, A-7A, and A-8 located on the upgradient side of the NBSL. The remaining samples did not receive organic analysis. Dissolved mercury was detected in only three wells that monitor the NBSL. Concentrations of dissolved mercury were detected in Wells A-8 (0.24 µg/L), A-15 (2.3 µg/L), and A-24 (4.2 µg/L). Dissolved barium was also detected in Well A-24 at a concentration of 221 µg/L. Figure 3-17 presents the distribution of dissolved mercury observed in the samples collected at the OBSL.

3.4.7 *Chemfix Test Unit*

3.4.7.1 *Geophysical Survey*

A ground-penetrating radar (GPR) survey was completed at the Chemfix Test Unit to obtain data to estimate the location, lateral extent, and depth to buried waste materials. In addition, the results of this survey were used to select soil-boring and waste-boring locations in the Chemfix Test Unit.

Figure 3-18 shows the location of the GPR reference grid and the interpreted boundaries of the four sludge stabilization test cells within the Chemfix Test Unit. The GPR data indicated the presence of four linear anomalies that are approximately 100-feet long by 25-feet wide. The anomalies are roughly parallel in orientation and are separated by a relatively consistent distance of 5 feet.

The anomaly reflections were characterized by a continuous, gently dipping-to-horizontal geometry that encompassed a depth range of 1 foot to 6 feet below the ground surface. The average depth to the anomalies was approximately 4 feet. The shallower depths are associated with the flanks of the test cells and the deeper depths are associated with the central basins of the test cells.

3.4.7.2 *Shallow Boring Program*

During the installation of the monitoring wells, it was discovered that the monitoring wells may have been installed through one of the berms that separated the cells of the Chemfix Test Unit instead of north of the Chemfix Test Unit as originally planned. The location of Well Nest A-27

was chosen based on reports which stated that the cells in the Chemfix Test Unit were 60 feet long, and the preliminary interpretation of GPR survey results which seemed to support this reported length. A shallow soil boring investigation was conducted on 4 January 1994 to further define the extent of the cell units.

After completing the shallow boring program, it was discovered that the waste cells were 100 feet long instead of 60 feet long as was originally thought, and that the wells had been installed through one of the cell berms. These wells were intended to monitor the ground water downgradient of the Chemfix Test Unit to assess the potential migration of constituents toward Red Lion Creek.

3.4.7.3 *Chemfix Test Unit Characterization*

The Chemfix Test Unit was characterized by two samples from two waste borings (WB-14 and WB-14A), three samples from one soil boring (SB-3), and two ground water samples from Wells A-27D and A-27S. Table 3-11 presents the results from samples collected from the Chemfix Test Unit.

The Chemfix Test Unit is characterized by elevated concentrations of VOCs and mercury. Figures 3-19 and 3-20 present the distribution of total key constituents observed in the samples collected at the Chemfix Test Unit.

Waste

Concentrations of vinyl chloride in the waste boring samples ranged from 23 µg/Kg to 220 µg/Kg. Other VOCs detected in these samples include: chloroform (18 µg/Kg), ethylbenzene (30 µg/Kg), PCE (90 µg/Kg), and trichloroethene (12 µg/Kg).

B2EHP was detected in the sample from Boring WB-14A at a concentration of 740 µg/Kg. This was the only SVOC detected in all of the samples collected at the Chemfix Test Unit.

The concentrations of mercury in the waste boring samples ranged from 0.66 mg/Kg in the WB-14A 2 to 4-foot sample to 80 mg/Kg in the WB-14 2 to 4-foot sample.

TCLP results indicate that benzene (0.03 mg/L) and barium (0.224 mg/L) were detected in a sample from WB-14A. However, these concentrations are below the regulatory limits of 0.5 mg/L and 100 mg/L, respectively.

Subsurface Soil

Moderate to elevated concentrations of VOCs were detected in the samples from Boring SB-3. The most prevalent VOCs were vinyl chloride (39 µg/Kg and 940 µg/Kg) and 1,2-dichloroethane (11 µg/Kg to 470 µg/Kg). The highest concentrations were detected in the 8 to 10-foot interval. Other VOCs detected in the soil boring samples include benzene, chlorobenzene, chloroform, 1,3-dichloroethene , and PCE. Concentrations of these constituents were below 20 µg/Kg.

There were no SVOCs detected in the soil boring samples, and metals concentrations were within background concentrations detected in the samples from SB-6.

Ground Water

Low to elevated concentrations of VOCs were detected in the ground water samples from Wells A-27S and A-27D, including vinyl chloride (59 µg/L to 180 µg/L) and carbon tetrachloride (36 µg/L to 180 µg/L). Other VOCs detected in the ground water include: chloroform and PCE. Concentrations of these compounds were below 15 µg/L. Concentrations of VOCs were generally higher in the shallow well, A-27S. There were no SVOCs detected in the ground water samples collected from Wells A-27S and A-27D.

Dissolved mercury was detected in Well A-27S at a concentration of 8.7 µg/L. Other metals were detected in the ground water samples, but at concentrations similar to background levels. Well A-27S was the only well in which dissolved mercury was detected.

3.4.8 *Former Storm Drainage Pond*

Three surface soil samples (SS-1, SS-2, and SS-3) were collected to characterize this area. No significant concentrations of constituents were detected in these samples. Table 3-12 presents the results for these samples.

3.5 *HUMAN POPULATION*

3.5.1 *Identification of Potential Human Receptors*

This section identifies and characterizes the potential human receptors who may contact soil, surface water, or ground water impacted by past

operations at the facility. Potential human receptors were identified based on the following:

- land use,
- demographic information,
- surface water use, and
- ground water use.

Information regarding local land use, surface water use and ground water use has been reviewed to identify individuals living, working, and/or engaging in recreational activities in the area. Demographic information available from the U.S. Bureau of the Census has also been reviewed to characterize the resident population. Demographic data were used to identify the size and age of the locality's population, and were useful in identifying potentially sensitive populations living in the vicinity of the facility.

3.5.1.1 *Demographics*

In the immediate vicinity of the facility, the dominant land use is industrial/commercial. Rural areas lie beyond the industrial facilities, and land use in these areas is primarily agricultural. The nearest residential area is over 1.5 miles from the facility. Census figures presented below are for the Red Lion subdivision of New Castle County and Delaware City. The Red Lion subdivision is a municipal planning district located in the center of New Castle County. It is bounded by Red Lion Creek, the Delaware River, the Chesapeake and Delaware Canal and Delaware Route 71 (Figure 3-21). Both the Red Lion subdivision data and the Delaware City data are presented to describe the rural population surrounding the facility, as well as the nearby urban population of Delaware City.

Aggregate figures from the 1990 Census indicated a total of 4,033 people residing in the Red Lion subdivision, 1,682 of whom reside in Delaware City. The 1990 Census report characterizes the Red Lion subdivision as rural with a predominantly white population (3,700 out of 4,033) that is relatively young. The median ages of residents in the Red Lion area and Delaware City are 34.6 and 33.7, respectively. Approximately 75.6 percent of the Delaware City population is less than 44 years of age. Table 3-13 provides the 1990 population of Delaware City by age distribution.

Individuals who may be present in the vicinity of the facility include employees and visitors at the facility and adjacent industrial/commercial facilities. Although recreational fishing may occasionally take place from

the Route 9 bridge on Red Lion Creek, limited access and private property restrict the recreational use of Red Lion Creek in the areas adjacent to the facility. In addition, there are not expected to be any significant sensitive sub populations in the vicinity of the facility, since no residences, schools or health-care facilities are located within one mile of the facility.

OxyChem employs approximately 155 full time people and 11 Class A (full time) contract workers. The majority of industrial operations take place within the facility process area. Therefore, the opportunities for worker exposure to the SWMUs investigated in the RFI are limited, since little to no industrial operations occur outside of the existing buildings.

3.5.1.2 Surface Water Use

The only known user of surface water within three miles of the facility is Star, which is located downstream of OxyChem on the Delaware River (ERM 1991). Because chloride concentrations in excess of 250 mg/L are present in the brackish Delaware River water, Star treats Delaware River water for industrial uses. Star has also pumped surface water from Red Lion Creek at its pump station located near Delaware Route 13 upstream of the facility. Red Lion Creek and the Delaware River are classified as secondary and primary recreational waters, respectively (ERM 1991), and may be used by boaters, fishermen, and hunters. In addition, the Delaware River is a navigable body of water used extensively for commercial transportation.

It should be noted that a fishing advisory has been issued by DNREC for Red Lion Creek due to the presence of chlorinated benzenes in surface water, sediment, and fish tissue. According to Mr. Roy Miller of the DNREC Fish and Wildlife Section, the source of this contamination was the accidental release of approximately 400,000 gallons of dichlorobenzene and 169,000 trichlorobenzene from Standard Chlorine in the late 1980s. Despite the advisory, the creek still appears to be used occasionally by recreational fisherman.

3.5.1.3 Ground Water Use

Five residential wells that tap the Columbia Aquifer (shallow aquifer) were identified within three miles of the facility. These wells serve approximately nineteen people (ERM 1991). However, each of these wells is located north of Red Lion Creek, which appears to function as a hydrogeologic barrier, thus precluding potential impacts to these wells from the facility. In addition, both Star and Standard Chlorine operate recovery wells that pump a total of 120 gallons per minute (gpm) and 30

gpm, respectively, from the Columbia Aquifer. Star operates three recovery wells, and Standard Chlorine operates four wells.

The only wells located in the Potomac Aquifer (deep aquifer) within three miles of the facility are nine production wells used by Star. West of Route 9. The facility receives its process and drinking water from the Wilmington Suburban Water Company. The nearest production well on the Star property is approximately 4,620 feet away from the facility, and it taps the Lower Hydrologic Zone of the Potomac Aquifer. The second nearest well on the Star property is approximately 1.1 miles away, which taps the Middle Hydrologic Zone of the Potomac. All wells tapping the Upper Hydrologic Zone are greater than three miles away. The nearest drinking water supply well in the Potomac Aquifer is six miles northwest of the site, on the opposite side of Red Lion Creek.

3.5.2 *Selection of Preliminary Action Levels for Humans*

In order to identify specific SWMUs and chemical constituents which may potentially pose an unacceptable risk to human receptors and thus require further investigation in Phase II, analytical data collected during the Phase I RFI were evaluated through comparison with media-specific action levels. The action levels used in this evaluation were summarized previously in Section 2.1.11.2 and are discussed below by medium in greater detail.

The preliminary results of the risk screening component of the RFI are presented in the following sections. Risk screening will be further refined and incorporated into the Phase II RFI Work Plan development. It will compare the Phase I RFI data to risk based concentrations (RBCs) rather than direct and leachate screening levels. Its purpose will be to identify, using the most recent EPA Region III guidance, potential constituents of concern (COC) for subsequent phases of the RFI.

3.5.2.1 *Soil*

The data review process for evaluation of potential human exposures to soil is shown in Figure 3-22. The initial screening involved a comparison of reported inorganic constituent concentrations with background concentrations. The Work Plan stated that the 95th percentile upper confidence limit on the arithmetic mean of background soil concentrations would be calculated to define the upper limit of the normal range within which a constituent could be expected to occur in soils unaffected by facility related activities. However, review of the analytical data from background samples indicated that many of the constituents were non-

detected. Statistical analysis was not appropriate because of an insufficient number of constituent detections to make the statistical analysis invalid. Review of the background data did indicate that concentrations of inorganic constituents in the background samples were consistent with regional concentrations (Shacklette and Boerngen 1984); therefore, these samples were considered to accurately reflect naturally occurring levels of these constituents. As a result, the ranges of inorganic constituent concentrations within each SWMU were compared to the range of background concentrations which are presented on Table 3-14. Constituents present at concentrations within the background range will not be further evaluated in Phase II.

For constituents that were present at concentrations greater than the background range, or constituents not positively detected in background samples, a comparison was then made to Direct Screening Levels (DSLs) and to Leaching Screening Levels (LSLs). Constituent concentrations which exceed either level will be further evaluated in the Phase II RFI. In addition, constituents with no available DSLs and LSLs were considered preliminary constituents of potential concern where they were positively detected.

Direct Screening Levels have been calculated for soil following the guidance of the EPA Region III Senior Toxicologist and are presented on Table 3-15. These screening levels were conservatively based on a residential land use scenario which incorporated standard default assumptions regarding exposure frequency, duration, and extent. This information was integrated with current toxicity data to establish conservative estimates of acceptable chemical concentrations. The screening levels represent concentrations which will not yield an unacceptable level of risk for the applicable route of exposure in the opinion of the EPA.

Leaching Screening Levels (LSLs) were derived using partitioning coefficients (*Kds*) to describe the relationship between acceptable soil concentrations and acceptable leachate concentrations, as shown below:

$$Kd = \frac{Cs\ (mg/kg)}{Cl\ (mg/L)} \qquad \text{(Equation 1)}$$

where

Kd = Distribution Coefficient (mg/kg/mg/L)

Cs = Chemical concentration in soil (mg/kg)

Cl = Chemical concentration in leachate (mg/L)

This relationship may be rewritten as:

$$Cs = Cl \times Kd \qquad \text{(Equation 2)}$$

For each reported constituent, a soil concentration (Cs) value was calculated as shown in Equation 2 and used as the LSL. In derivation of LSLs, the acceptable leachate concentration was conservatively assumed to be equal to the Maximum Contaminant Level (MCL) or the Direct Screening Level (DSL) for ground water. Because no correction was made in this screening to account for the dilution of leachate after mixing with ground water, this analysis is quite conservative.

LSLs developed for this screening are presented on Table 3-16. As indicated on this table, the distribution coefficients for organic chemicals were estimated as the product of the organic carbon partition coefficient (koc) and the fraction of organic carbon present in the soils (EPA 1988). The fraction of organic carbon used for this evaluation was 0.02. Distribution coefficients for inorganics were obtained directly from the literature. The estimation of Kd values in this assessment is conservative and does not consider many of the physical and chemical characteristics which can reduce chemical mobility in soils. Koc and Kd values are presented on Table 3-16.

3.5.2.2 *Ground Water*

As previously discussed in Section 3.4, only analytical data for organics and dissolved inorganics have been evaluated in this assessment. Organic and dissolved inorganic constituent concentrations in ground water were initially compared with background concentrations shown on Table 3-4. If a constituent concentration was less than the background concentration, it was not evaluated further. Constituent concentrations in excess of the background concentration, or constituents not positively detected in background samples were subsequently compared with Maximum Contaminant Levels (MCLs), where available, or with DSLs. Constituents which exceed ground water screening levels (MCLs or DSLs) will be further evaluated in the Phase II RFI. Similar to the procedure discussed for evaluation of soil data, constituents with no available screening level were considered preliminary constituents of potential concern where they were positively detected.

Direct Screening Levels for ground water (Table 3-15) were calculated according to the same methodology discussed above for calculation of soil

DSLs. Standard residential exposure assumptions were integrated with current toxicity data to establish conservative estimates of acceptable chemical concentrations. The screening levels represent concentrations which will not yield an unacceptable level of risk for the applicable route of exposure in the opinion of the EPA.

3.5.3 *Constituents of Potential Concern for Humans*

For preliminary screening purposes, constituents of potential concern for soils within each SWMU were based on the exceedance of background concentrations, DSLs, and LSLs, as described above. Selection of constituents of potential concern for ground water within each of the SWMUs was based on the exceedance of background concentrations and ground water screening levels, as discussed above.

In the case of iron and sodium, DSLs, MCLs, and LSLs were not available for soil or ground water. In addition, these constituents were not positively detected in background ground water samples. Therefore, inclusion of these nutrients as constituents of potential concern was based solely on the reported positive detections. It is important to note that although iron and sodium have been identified as constituents of potential concern for specific SWMUs, reported levels of these nutrients do not necessarily indicate a potential for human health problems. Iron is an essential nutrient, and in general, excess ingested iron is excreted. Environmental accumulations of iron are generally less important routes of exposure than accidents or occupation (Amdur, et. al. 1991). Similarly, sodium is an essential element that is the principal electrolyte in extracellular fluids which is excreted in the urine. (Clayton and Clayton 1981). The significance of the reported concentrations of these nutrients will be further evaluated in the Phase II Investigation.

Table 3-17 summarizes the results of the comparison of reported concentrations of both organic and inorganic constituents detected in soil/waste samples to background levels, DSLs and LSLs. Detailed tables presenting the comparison of reported inorganic constituent concentrations within each SWMU to background levels are provided in Appendix F (Tables F-1 through F-6).

Only three constituents, manganese, sodium, and zinc, were positively detected in the background ground water samples. Therefore, only these constituents were compared with background levels. Detailed tables presenting the comparison of constituent concentrations in ground water with background levels are provided in Appendix F (Tables F-7 and F-8). All other constituents were compared directly with ground water

screening levels. Table 3-18 presents a summary of organic and inorganic constituent exceedances of ground water screening levels for each SWMU.

It should be emphasized that the direct screening levels used in this assessment are based on conservative toxicity and exposure information, and that actual exposures associated with the facility are likely to be much less than those characterized for the purposes of this evaluation. Thus, exceedances of the soil and ground water DSLs do not necessarily indicate an unacceptable level of risk to workers at the facility or to residents living in the vicinity of the facility. However, exceedance of these screening levels does indicate that further evaluation is warranted.

The constituents listed in Tables 3-17 and 3-18 will be further evaluated as part of the Phase II Investigation. A more detailed discussion of the results of the soil and ground water data comparisons to media-specific screening levels is presented in the following subsections by SWMU.

3.5.3.1 *Waste Lake 1*

- Several inorganic constituents in soil/waste samples from Waste Lake 1 exceeded background levels; however, only arsenic, barium, chromium, and mercury exceeded their direct screening levels. It should be noted that chromium exceeded the DSL for hexavalent chromium in only one sample. The reported concentration of chromium in this sample is less than the DSL for trivalent chromium, and it is likely that trivalent chromium is the dominant species present in the soil (Dragun 1988). However, in order to ensure that subsequent phases of the RFI are correctly focused, chromium has been identified as a constituent of potential concern.
- Concentrations of benzene, 1,4-dichlorobenzene, hexachlorobenzene, 1,2,4-trichlorobenzene, and vinyl chloride at WL-1 exceeded soil DSLs. Concentrations of the latter three constituents exceeded DSLs in only two out of ten samples, one out of ten samples, and two out of fourteen samples, respectively.
- Several inorganic and organic constituents exceeded their LSLs. However, it is important to note that the results of the TCLP analysis for samples collected at WL-1 indicated that only benzene, 1,4-dichlorobenzene, and vinyl chloride were present in TCLP samples at levels in excess of regulatory limits.
- Concentrations of manganese, sodium, and zinc in ground water samples exceeded background levels.

- Reported levels of arsenic, cadmium, manganese, and mercury exceeded ground water screening levels. However, only manganese and mercury exceeded these levels in more than one sample out of 7.
- Several organic constituents were present at levels greater than their ground water screening levels. It is important to note that only benzene, 1,2-dichlorobenzene, and 1,4-dichlorobenzene exceeded screening levels in more than one or two samples.

3.5.3.2 *Waste Lake 2*

- Several inorganic constituents exceeded background soil levels; however, only arsenic, beryllium, manganese, and mercury exceeded their direct screening levels. In addition, the only organic constituents to exceed soil DSLs were benzene and 1,4-dichlorobenzene.
- Concentrations of several inorganic and organic constituents in soil exceeded their LSLs. However, only manganese concentrations in ground water exceeded a screening level.
- Concentrations of manganese and zinc in ground water samples exceeded background levels, while concentrations of sodium exceeded background levels in one ground water sample.

3.5.3.3 *Waste Lake 3*

- Several inorganic constituents from WL-3 exceeded background soil levels. However, only antimony, arsenic, lead, manganese, and mercury exceeded their direct screening levels. It should be noted that antimony, lead, and mercury exceeded DSLs in only one sample each out of 11, while arsenic and manganese exceeded DSLs in only two samples each out of 11.
- Concentrations of bis(2-ethylhexyl)phthalate, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, and vinyl chloride exceeded DSLs in soil. Concentrations of the first three constituents exceeded DSLs in only one sample each.
- Concentrations of several inorganic and organic constituents exceeded their LSLs. However, only the concentration of bis(2-ethylhexyl)phthalate in one ground water sample exceeded a screening level. It should be noted that bis(2-ethylhexyl)phthalate is a common laboratory contaminant (EPA 1989), and its presence at low ppb levels is suspect.
- Only chromium was positively detected in leachate from the WL-3 TCLP sample, and it was less than the regulatory limit.

- The reported concentration zinc in one ground water sample exceeded background levels.

3.5.3.4 *Old Brine Sludge Landfill*

- Several inorganic constituents from the OBSL exceeded background soil levels. However, only arsenic, manganese, and mercury exceeded their DSLs. It should be noted that concentrations of arsenic and manganese exceeded DSLs in only one sample each.
- Concentrations of bis(2-ethylhexyl)phthalate and vinyl chloride exceeded DSLs.
- Several inorganic and organic constituents exceeded LSLs; however, it is important to note that only vinyl chloride was present in the TCLP sample above the regulatory limit.
- The only constituent to exceed a ground water screening level was manganese. In addition, manganese, sodium, and zinc exceeded background levels for ground water.

3.5.3.5 *New Brine Sludge Landfill*

- No soil/waste samples were collected at this SWMU.
- The only constituents to exceed ground water screening levels were manganese and mercury. In addition, manganese and zinc exceeded background levels for ground water.

3.5.3.6 *Chemfix Test Unit*

- Several inorganic constituents in soil samples from the Chemfix Test Unit exceeded background levels. However, only arsenic, manganese, and mercury exceeded their DSLs. It should be noted that arsenic and mercury exceeded DSLs in only one sample each, while manganese exceeded the DSL in only two samples.
- The concentration of vinyl chloride in one sample was greater than the soil DSL.
- Concentrations of benzene, 1,2-dichloroethane, tetrachloroethene, vinyl chloride, cadmium, manganese, and mercury exceeded LSLs. However, only benzene and barium were detected in the TCLP sample, and they were both present at concentrations less than the regulator limit.

- Concentrations of mercury, carbon tetrachloride, and vinyl chloride were greater than their ground water screening levels. In addition, zinc exceeded ground water background levels in one sample.

3.5.3.7 *Storm Drainage Pond South of Waste Lake 1*

- Concentrations of barium, mercury, manganese, sodium, nickel, and zinc exceeded background soil levels.
- The concentration of manganese in one sample exceeded the DSL for soil. In addition, mercury, manganese, and nickel exceeded LSLs.
- No organic constituents exceeded soil DSLs or LSLs.
- Ground water samples and TCLP samples were not collected at this SWMU.

3.6 *ECOLOGICAL SETTING*

3.6.1 *Site Ecology*

3.6.1.1 *Habitat Covertype Descriptions*

Six general habitat covertypes were identified within the facility property and surrounding area. These habitats included:

1) open water;
2) forested upland;
3) palustrine scrub-shrub wetland;
4) palustrine emergent wetland;
5) upland herbaceous; and,
6) mudflats/open water.

Figure 3-23 provides a habitat covertype map illustrating the site and its immediate surrounding area. A habitat covertype map provides a visual display of habitat size and areal extent; makes a visual link between different habitats and associated fauna; and, makes future predictions of exposure and transport based on realistic assumptions. Table 3-19 presents a list of common vegetative species observed within each of the habitat covertypes during a field reconnaissance survey conducted by ERM ecologists on October 26, 1994. Observations of wildlife or signs of wildlife (bird calls, scat (feces), tracks) noted during the field reconnaissance survey and species that are expected to inhabit these

covertypes are presented in Table 3-20. A description of each of these habitats including the plant species present and the associated wildlife species is provided below.

Open Water

Surface water within the mapped area consists of Red Lion Creek and its floodplain north of the facility and the Delaware River east of the facility. The main channel of Red Lion Creek varies in width from 40 feet at the Route 9 bridge crossing to 350 feet near the confluence with the Delaware River but averages approximately 250 feet.

The Red Lion Creek discharge to the Delaware River is controlled by tide gates located just above the confluence of Red Lion Creek and the Delaware River. During high tide, the gates are closed due to pressure exerted by the higher river water elevations. Water flowing from the Red Lion Creek watershed is impounded behind the closed flood gates during high tide and is spread throughout the numerous shallow channels within the adjacent emergent wetland. Low tide on the river allows the gates to open and Red Lion Creek water to discharge. At low tide on the Delaware River, the flood gates open and the impounded water recedes from the emergent wetland to Red Lion Creek and the Delaware River. The flood gates therefore eliminate tidal fluctuations and the flow of brackish water from the Delaware River to Red Lion Creek, and the continuous impoundment of water flowing from the Red Lion Creek watershed.

According to the DelDOT, on past, undocumented occasions, the flood gates on Red Lion Creek have been non-operational due to vandalism or mechanical problems. At these times, the gates were either closed shut or stuck open. When the gates were stuck in the closed position, extensive flooding of Red Lion Creek and the surrounding emergent wetland area occurred. The impoundment of water changed Red Lion Creek from a slow flowing stream confined to its banks to a large impoundment which covered the entire floodplain. When the gates were stuck open, water from the Delaware River would flow into Red Lion Creek during high tide, resulting in temporary tidal flooding of the emergent wetlands and floodplain. Then during low tide, the water would recede from Red Lion Creek back into the Delaware River. During these periods, Red Lion Creek and its floodplain were changed to a tidal estuary stream which received both saltwater and freshwater. Depending on the tidal regime of the Delaware River, the floodplain of Red Lion Creek would appear as a shallow impoundment at high tide or a floodplain at low tide.

Fish inhabiting the river near the OxyChem facility include both freshwater and marine species. A list of fish species that would inhabit the Delaware River was provided by yearly fish surveys conducted by the DNREC Division of Fish and Wildlife. These species of fish are presented in Table 3-20.

The fish population of Red Lion Creek, upstream of Route 13 was characterized by the DNREC, Division of Fish and Wildlife during 1988. Route 13 is located approximately 1 mile upstream of the Route 9 bridge crossing. The results of their sampling indicated that the American eel, pumpkinseed, common carp, and white perch were the most abundant species. Other species present included largemouth bass, golden shiner, bluegill, banded killifish, brown bullhead, gizzard shad, eastern mud minnow, white sucker, black crappie, and tessellated darter. It was assumed that these species would also inhabit the lower section of Red Lion Creek near the facility.

A number of birds are likely to utilize Red Lion Creek and the Delaware River for feeding, nesting, or migratory stopovers. During the field survey, a great egret, Canada geese, double-crested cormorant, osprey, and herring gull were observed within Red Lion Creek and the river. Several species of ducks are also likely to feed within Red Lion Creek and the river. These observed species and other species expected to occur within the open water of the creek and river are listed in Table 3-20.

Forested Upland

A narrow forested upland occurs along the slope between the developed portion of the facility and the floodplain of Red Lion Creek. The approximate size of this wooded area is 6 acres. The dominant trees within this area included red maple and black locust. Understory shrub species most common included blackberry and northern arrowwood. Herbaceous ground cover was limited to small stands of common reed and Japanese honeysuckle due to the thick shrub layer within this area. Other less common vegetative species present within this covertype is listed in Table 3-19.

This narrow forested upland provides a transition area between the floodplain wetlands and the developed portion of the property. The tree and shrub species present within this covertype provides food, nesting and cover for a variety of wildlife species. During the field reconnaissance survey, seven species of birds were observed within the forested upland. A woodchuck burrow was also noted along the side hill. These observed species and other representative species that are expected to occur within

this covertype are listed in Table 3-21. Vegetative species present within this area, such as American crabapple, apple, mulberry, pin cherry, red cedar, arrowwood, silky dogwood, bayberry, and blackberry provide fruits and berries as food for both mammals and birds. The thick understory provides shelter and nesting areas for a variety of the species listed in Table 3-20.

Palustrine Scrub-Shrub Wetland

A small palustrine scrub-shrub wetland approximately 4 acres in size is located within the floodplain of Red Lion Creek north of WL-1. This habitat covertype is located adjacent to the forested upland to the south and the mudflats/open water to the north. This covertype consisted mainly of shrubs and herbaceous vegetation, however, younger trees provided additional cover. The dominant shrubs within this area included groundsel-tree and northern bayberry and the dominant herbaceous vegetation included switchgrass, broom sedge and common reed. False indigo was the most common tree species. The areal coverage of vegetation within this area varied from a thick growth of shrubs to a thin growth of switchgrass and other herbaceous vegetation to a small area completely devoid of vegetation.

Distinct bands of vegetation occur along the northern boundary of the scrub-shrub wetland with the mudflats/open water. The distinct bands of vegetation are narrow in width and consist of switchgrass along the edge of the mudflat/open water, groundsel-tree and poison ivy upgradient from the switchgrass, and common reed further upgradient. Other vegetative species observed within the scrub-shrub wetland covertype are listed in Table 3-19.

The scrub-shrub wetland although small in size compared to the other habitats within the area provides a diverse habitat in-terms of vegetative species and food availability. This diversity would provide ample food, nesting, and cover for many of the wildlife species listed in Table 3-20. Raccoon and white-tailed deer tracks were observed throughout this area.

Palustrine Emergent Wetland

The emergent wetland is the largest habitat covertype (84 acres) within the floodplain of Red Lion Creek. The dominant species, common reed, makes up nearly 100 percent of the vegetation found within this habitat. The common reed are approximately 20 feet high and grow in thick monoculture stands. Vegetative diversity is much higher along the open water's edge of the common reeds. Portions of the fringe area along the

edge of the open water and mudflats consist of smooth cordgrass, switchgrass, and soft stem bulrush. This fringe area is narrow and is not continuous along the entire emergent wetland edge.

Common reed is an opportunistic species that becomes established during periods of disturbance. The monotypic community of common reed is not a very valuable source of food or cover habitat for most species of wildlife. Common reed does not provide a food source for primary productivity because it does not breakdown into organic detritus. Common reed does not provide food for many animals and therefore limits use of the wetland to a few wildlife species such as muskrat, deer, raccoon, red-winged blackbird, marsh wren, swamp sparrow, and a few rodent species. The fringe area of the common reed habitat covertype although small, does provide a more valuable food source to the aquatic food chain in the form of detritus. Smooth cordgrass is immensely productive due to its rapid breakdown into organic detritus. Also the seeds, plant parts, and rootstocks of smooth cordgrass, switchgrass, and soft stem bulrush provide food for many species of shorebirds, song birds, waterfowl, and mammals. These plant species also provide cover and nesting habitat for fish and a variety of birds.

Upland Herbaceous

The upland herbaceous covertype is comprised of WL-1 and WL-2 and the former storm water drainage pond located south of WL-1. The total area, approximately 57 acres, is the largest covertype within the upland portion of the study area. WL-1 appears to be maintained by mowing and is dominated by perennial ryegrass, perennial bentgrass, and crown vetch. A few individual shrubs such as groundsel-tree, multiflora rose and autumn olive occur within this area. The majority of WL-No. 2 is dominated by common reed. Other vegetation found within WL-2 consists of perennial ryegrass, and a few individual black locust and groundsel-tree. During the field reconnaissance survey, most of the common reed within WL-2 was cut down to allow for the completion of soil borings, geophysical survey and well drilling. No water or saturated areas were observed within either Waste Lake areas.

The former storm water drainage pond is a small depression dominated by common reed. A small drainage ditch is located in the middle of the area. Other vegetation found within this area include perennial ryegrass, and a few individual smooth sumac and groundsel-tree.

The vegetation within these upland herbaceous fields provide some food value to wildlife. The seeds and plant parts of the grasses and clover, and

the buds from multiflora rose provide some food value for many species of birds and mammals. The lack of cover for small mammals and birds provide suitable hunting areas for raptors such as the red-tailed hawk, northern harrier, and kestrel. The latter two species were observed within Waste Lake No. 2 during the field survey.

Small birds observed within this area included mourning dove, northern flicker, American crow, American robin, European starling, house sparrow, Savannah sparrow, and song sparrow. Other birds expected to occur within these areas are listed in Table 3-21. Mammals including rabbits, rodents, woodchuck, fox, raccoon, skunk, opossum, and deer are expected to occur within these areas.

Mudflats/Open Water

The mudflats/open water habitat consist of shallow open water areas and exposed mudflats surrounded primarily by the emergent wetland and scrub-shrub wetland. Based on a review of aerial photographs, these open water areas are connected to Red Lion Creek by narrow drainage ways which traverse through the thick common reed. The mudflats are saturated non-vegetated areas that consist of black sandy mud and are located around the outer edges of the open water areas. The open water areas are shallow and lack submerged vegetation. The total acreage of this habitat covertype is approximately 14 acres.

It is expected that the width of the mudflats and the size of the open water areas are dependent on the tidal stage of the Delaware River. As stated previously, the impounded water behind the closed flood gates during high tide on the river, is likely to flow into these open water areas and inundate the mudflats. During the receding tide on the Delaware River, the water within the open water areas and mudflats would likely flow to Red Lion Creek and out the opened flood gates.

These shallow open water areas and mudflats, surrounded by emergent vegetation and located in remote areas away from Red Lion Creek, provide cover and nesting areas for a number of fish and invertebrate species. The fish, invertebrates, mudflats, and the fringe emergent vegetation also attract several waterfowl species, heron species, and other shorebirds. These birds would likely utilize the open water and mudflats for feeding and resting. A large number of green-wing teal and northern shoveler ducks were observed during the field survey. White-tailed deer and raccoon tracks were observed throughout the mudflats during the field reconnaissance survey. Other birds and mammals expected to inhabit the mudflats/open water areas are listed in Table 3-20.

3.6.1.2 *Threatened and Endangered Species*

Data searches for threatened and endangered plants, animals, and natural communities in the vicinity of the facility indicated that species of special concern were not reported to exist within the facility boundary. Due to the close proximity to Pea Patch Island, herons and waterfowl species are likely to occasionally feed within Red Lion Creek and the associated mudflats/open water areas within the floodplain. During the field reconnaissance survey a great egret was observed feeding within Red Lion Creek near the Route 9 bridge crossing. It is not likely that these heron species are breeding within the habitat covertypes identified adjacent to the site due to the limited number of trees which are required for roosting and nesting.

DNREC data indicated that numerous threatened and endangered species of plants, amphibians, reptiles, fish, and birds occur within the vicinity of the facility (Table 3-21). Four (4) state and four (4) federal endangered species, bog turtle (state), swamp pink (federal), shortnose sturgeon (state and federal), bald eagle (state and federal), and peregrine falcon (state and federal), were identified as occurring within the vicinity of the facility, but no specific location was provided. DNREC's Division of Parks and Recreation (DPR), reported four (4) rare and threatened plant species occur about 1 mile west (upstream) of the facility within the Red Lion Creek watershed. These species are: gray birch, mountain mint, weakstalk bulrush, and poison sumac.

3.6.1.3 *Preliminary Receptor Characterization*

The objective of this section is to concentrate on the selection of preliminary receptors that may be impacted by the surficial soils within the SWMUs. Table 3-20, lists wildlife species that are expected to occur within the habitats identified within the site and may come in contact with the surficial soils of the various SWMUs. The main exposure routes of contaminated soils to animals would be the direct ingestion of soils, the indirect ingestion of soils through their diet or consumption of contaminated vegetation.

Wildlife species that would have the greatest exposure to contaminated surficial soils would be those species that are most abundant, occur as year-round residents, have a small home range and feed primarily within the upland herbaceous areas (WL-1 and WL-2 and the Former Storm Drainage Pond) of the property, and are either herbivores (feed on plants only) or omnivores (feed on both animal and plant matter). Based on the above assumptions, species that would likely have the greatest exposure

to the surficial soils within the above three SWMUs would include the following:

- earthworms
- star-nosed mole
- eastern mole
- northern short-tailed shrew
- least shrew
- meadow vole.

The determination of potential wildlife receptors to surface water and ground water constituents will be conducted during Phases II and III after the collection of Phase II surface water and sediment samples and the survey of macroinvertebrates and fish within Red Lion Creek during Phase III activities. The final determination of potential receptors and the selection of indicator species for all possible exposure routes will be conducted during Phase III.

3.6.2 *Selection of Preliminary Action Levels for Ecological Receptors*

Screening to determine preliminary action levels and potential constituents of concern for ecological receptors was conducted using the RFI soil and ground water sampling results and published toxicological data.

Only surficial soils (less than 2 feet in depth) were evaluated in the screening process since an ecological exposure to subsurface soils (greater than 2 feet in depth) is not considered likely within the SWMUs. Background soil concentrations were considered action levels for the surficial soils collected from each SWMU. Appendix G (Table G-9) presents the constituents that were detected within the each of the surficial soil samples and the minimum and maximum concentrations detected within the background samples and each of the SWMUs.

For ground water, the conservative assumption was made that ground water, both shallow and deep, discharges directly into Red Lion Creek and other surface water areas within the floodplain without dilution. Therefore, aquatic exposure would result from direct contact with the ground water discharge. Given this assumption, the minimum and maximum downgradient ground water concentrations from each SWMU (both shallow and deep wells) were screened first by comparing the results to federal and state Ambient Water Quality Criteria (AWQC) and

to readily available Lowest Observed Effect Levels (LOELs). If an AWQC or LOEL was not available for a certain constituent, the shallow or deep ground water concentration was then compared to the shallow or deep background concentration, respectively.

As previously discussed in Section 3.4, only analytical data for organics and dissolved inorganics have been evaluated in this screening. In the case of zinc, minimum and maximum concentrations were not compared to background concentrations since AWQC values were available. Appendix G (Table G-10) presents the minimum and maximum shallow ground water concentrations detected within the each of the SWMUs compared to the appropriate AWQC or LOEL and shallow background concentration. Appendix G (Table G-11) presents the minimum and maximum deep ground water concentrations detected within the each of the SWMUs compared to the appropriate AWQC or LOEL and deep background concentration.

The collection and screening of additional data from surface water and sediment will be conducted during Phase II activities. In addition, a toxicity assessment to better refine the list of potential constituents of concern regarding ecological receptors will be conducted during the Phase III activities.

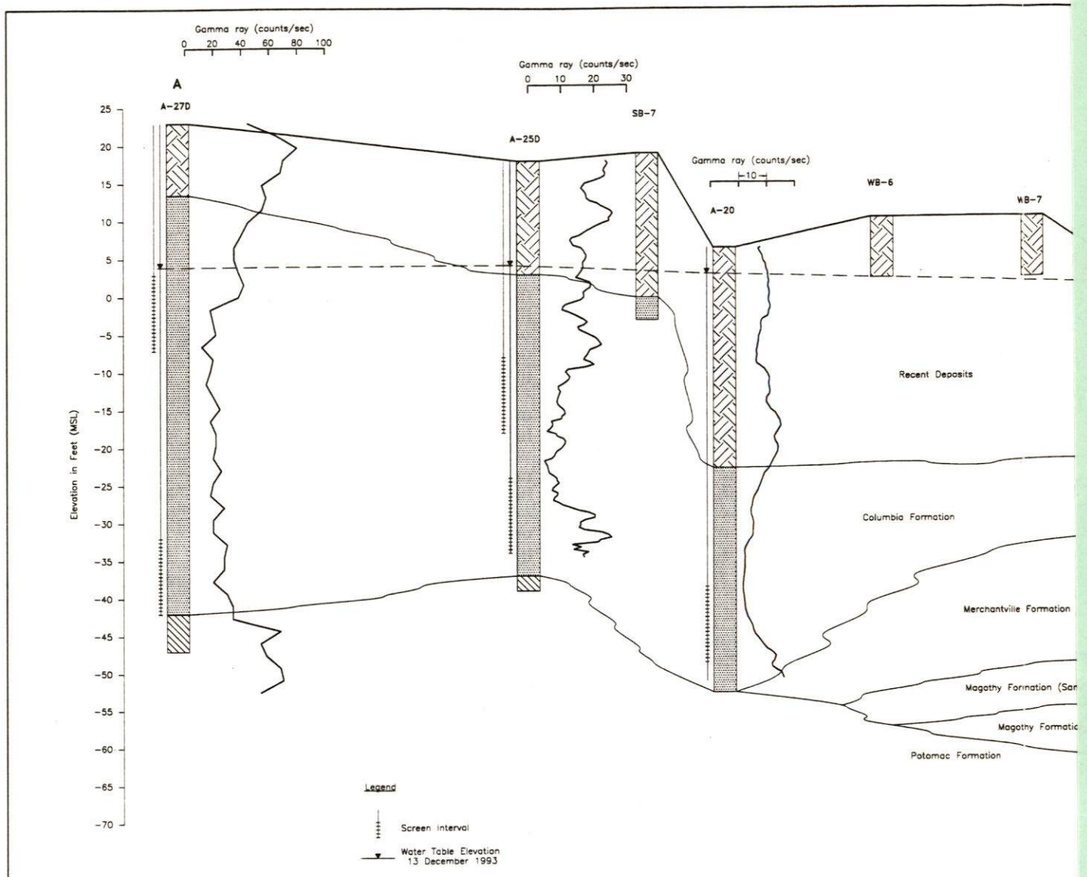
3.6.3 *Potential Constituents of Concern for Ecological Receptors*

For preliminary screening purposes, potential constituents of concern for surficial soils were based solely on the exceedance of background concentrations, as described above. The constituents detected within the surficial soils of each SWMU consisted primarily of metals. Waste Lake No. 2 had the greatest number of metals (nine) detected above background and was the only SWMU where SVOCs were detected. The surface soil constituents of potential concern for each of the SWMUs are presented in Table 3-22. The extent of detected constituents varied moderately in concentration and occurrence within each of the SWMUs. Thus, some constituents represent a greater potential for risk to the environment than others because of differences in toxicity, frequency of detection, and concentrations detected in the soils. As mentioned previously, the constituents of potential concern will be further narrowed down by evaluating toxicity and frequency of detections during the Phase II activities.

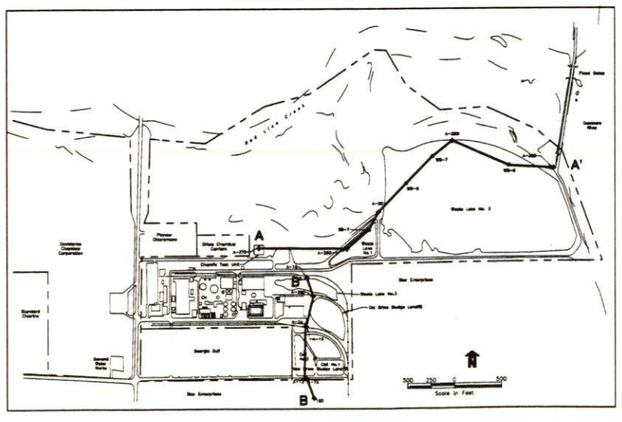
Selection of constituents of potential concern for ground water within each of the SWMUs was based on the exceedance of federal and state criteria, readily available toxicity data, or background concentrations, as discussed

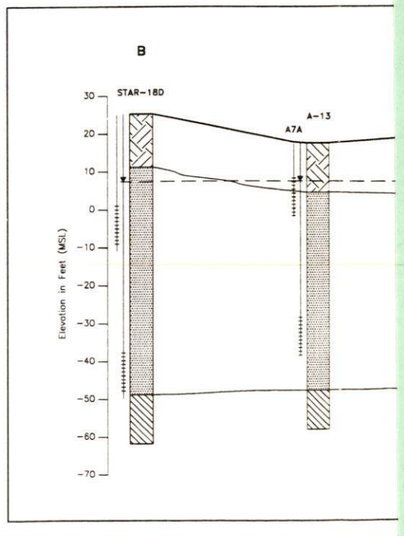
above. Within the shallow aquifer, most of the constituents detected above the AWQC or LOEL values were collected from WL-1. These constituents of potential concern for WL-1 included five metals, four VOCs and four SVOCs, as listed in Table 3-23. Metals were the primary constituents of concern for the other SWMUs with the exception of several individual organics detected within WL-3, the Chem-Fix Test Unit, and the NBSL.

Similar to the shallow ground water, most of the constituents of potential concern for the deep aquifer were detected within WL-1. These Waste Lake No. 1 deep ground water constituents of potential concern included five metals, two VOCs and six SVOCs , as listed in Table 3-24. The constituents of potential concern for the other SWMUs consisted primarily of a few metals, with the exception of one volatile organic detected within the Chem-Fix Test Unit. No deep ground water constituents of concern were identified for Waste Lake No. 3 and the Old Brine Sludge Landfill.



Cross Section Location Map





Section 3 Figures

Figure 3-3
Example Bouwer and Rice Data Plot
Occidental Chemical Corp.
Delaware City, DE

Bouwer and Rice Slug Test Calculations *

Well R-100 — Case 1: Standard Bouwer and Rice
Slug In — K gravel pack >> K formation
No Gravel Pack Drainage

Definition Of Variables:

D : Saturated Aquifer Thickness
H : Depth of Water in the Well
H = Static Water Elev. - Elev. of Well Bottom
L : Length of Gravel Pack Below Water Table
Note: L = H if Water level is Below the Top of the Screen
A & B : Well Geometry Factors - from Bouwer & Rice, Figure 3
rc : Inner Radius of the Well casing
rw : Radius of the Gravel Pack
Yo : Water Level Displacement at time = 0
t : Arbitrary Time from Recovery vs Time Plot
Yt : Water Level Displacement at time = t

Determined Values for Variables:

D =	55	feet	
H =	24	feet	Notes:
L =	5	feet	If H=L then there should be gravel pack drainage or K pack= K formation
A =	2.2		L/rw = 20
B =	0.3		
rw =	0.25	feet	
rc =	0.167	feet	
Yo =	1.72	feet	
t =	600	minutes	
Yt =	0.1	feet	

Calculations

(1/t)*ln(Yo/Yt) = 0.0047

ln(Re/rw) = 1/(1.1/ln(H/rw)+(A+B*ln((D-H)/rw))/(L/rw))
= 2.3624

K = (rc*rc*ln(Re/rw)*(1/t)*ln(Yo/Yt))/(2L)
= 0.04 feet/day = 1.59E-05 cm/sec

* Reference: Bouwer,H and Rice,R.C, 1976: A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells: Water Res. Res. V.12. No. 3

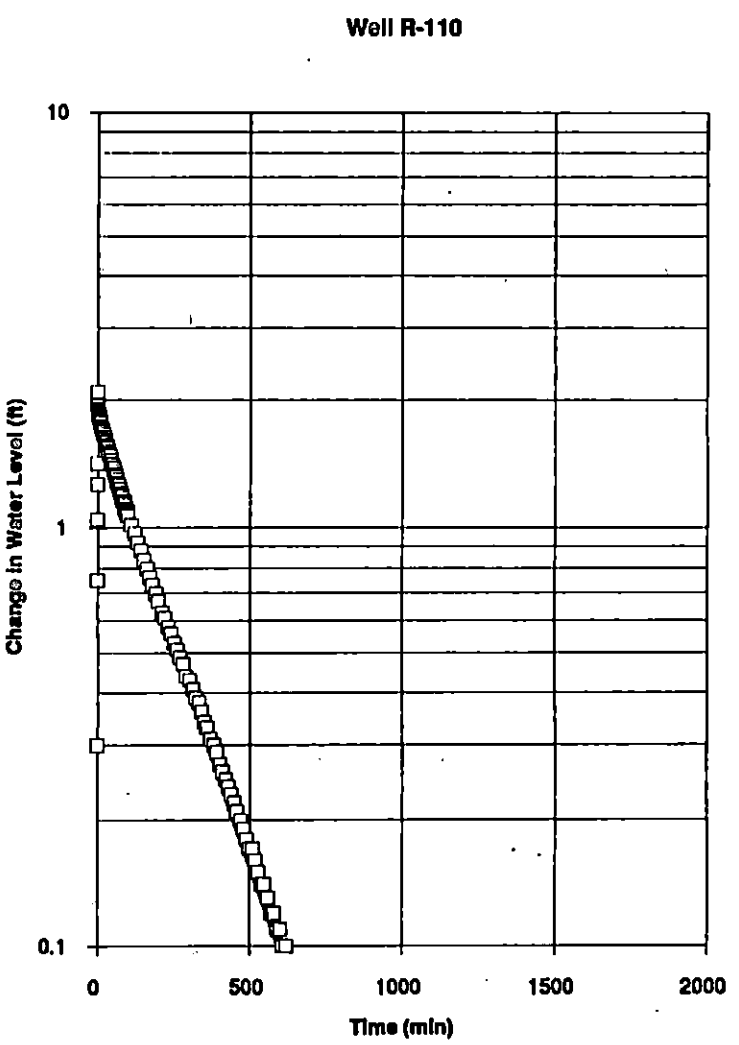


Figure 3-4
Example Cooper-Papadopulos Data Plot
Occidental Chemical Corp.
Delaware City, DE

Cooper-Papadopulos Slug Test Calculations *

Well A-29S, Slug In

Definition Of Variables:

rc : Inner radius of the well casing (draining casing)
rw : Radius of the boring/gravel pack
Ho : Water level displacement at time = 0
T : Aquifer transmissivity
K : Aquifer hydraulic conductivity
b : aquifer saturated thickness
S : Aquifer storage coefficient

Well / aquifer parameters:

rw = 0.25 feet
rc = 0.167 feet
b = 30 feet

Curve fitting parameters (adjust to match data)

Ho = 1.66 feet
T = 17 sq ft / day

Best fit curve

α = 1 E-4

Calculations

K = T/b
= 0.57 ft/day
S = 4 E-5 dimensionless

* Reference: Cooper, H.H., Bredehoeft,J.D., and S.S.Papadopulos Response of a finite diameter well to and instantaneous charge of water, Water Resources Research, 1967 3(1) pp 263-269

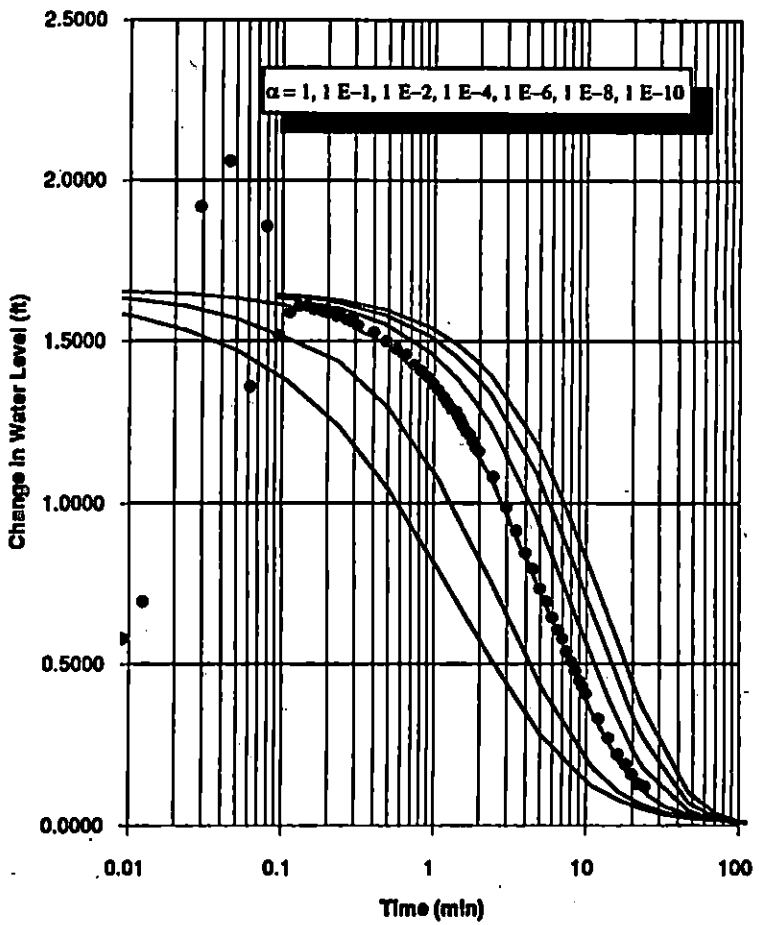
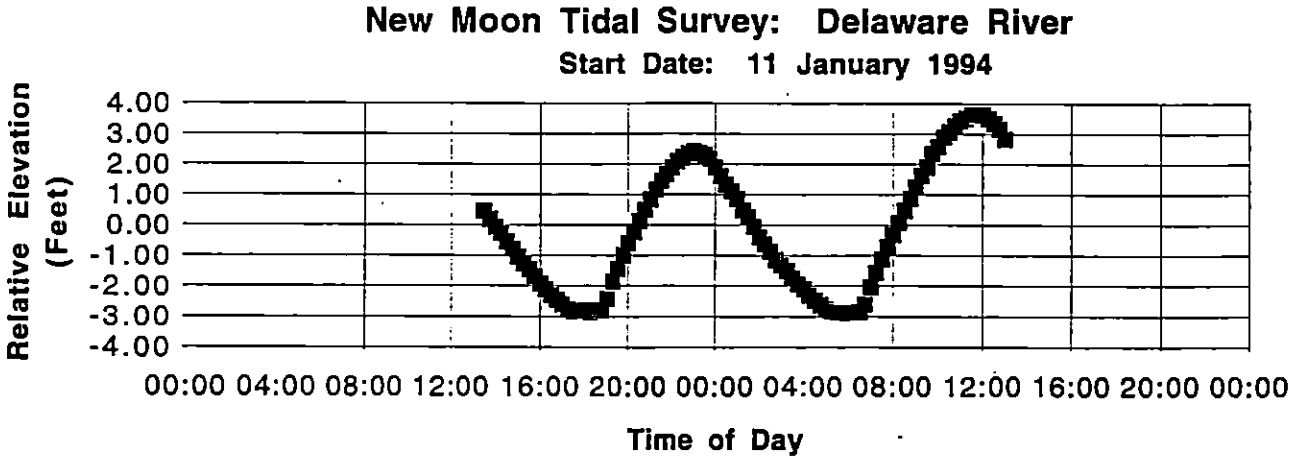
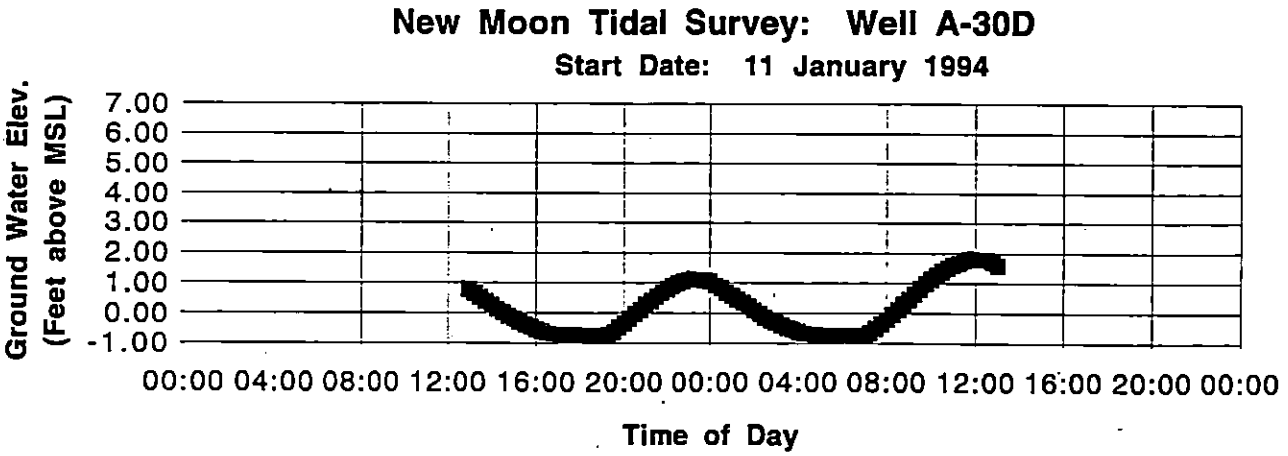


Figure 3-5
Summary of Tidal Survey Data
Occidental Chemical Corp.
Delaware City, DE





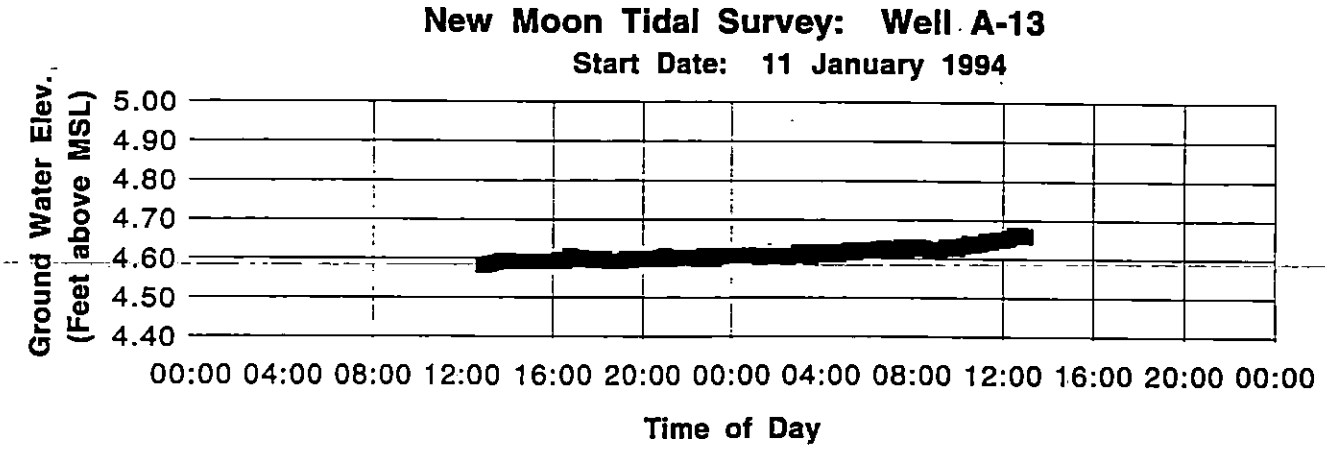
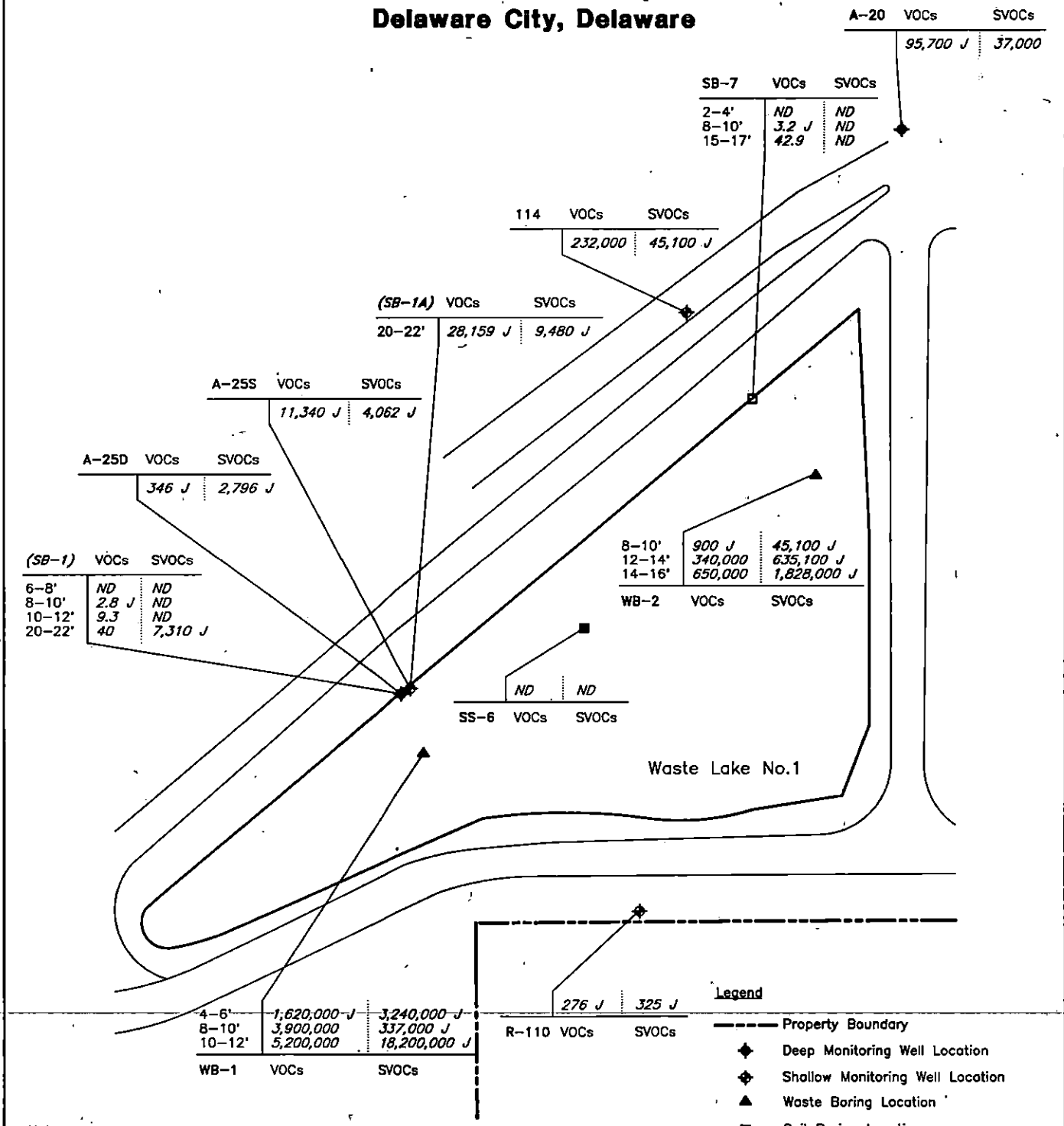
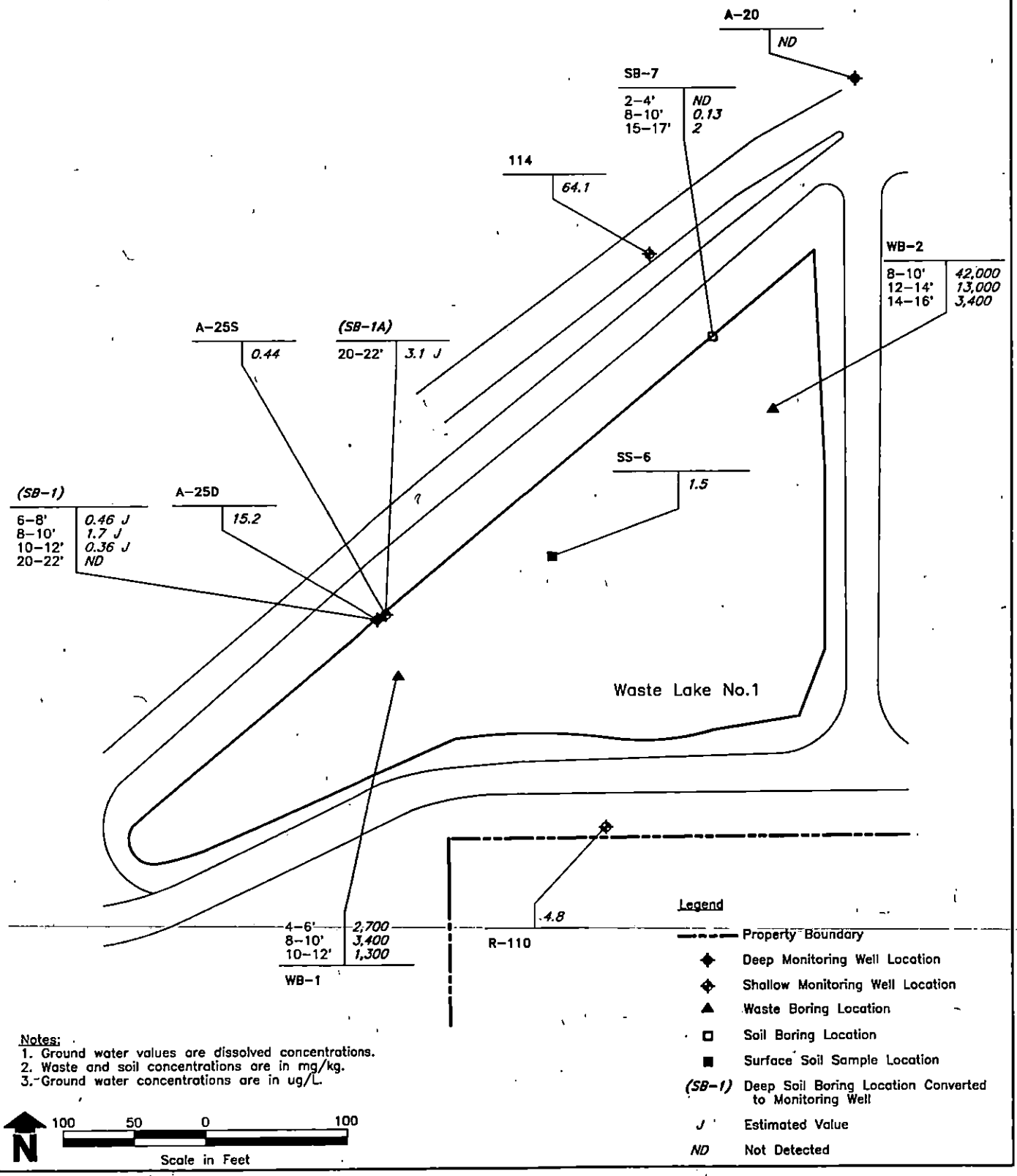


Figure 3-6
Distribution of Total VOCs and Total SVOCs in Soil, Waste, and Ground Water Samples
Waste Lake 1
Occidental Chemical Corporation
Delaware City, Delaware



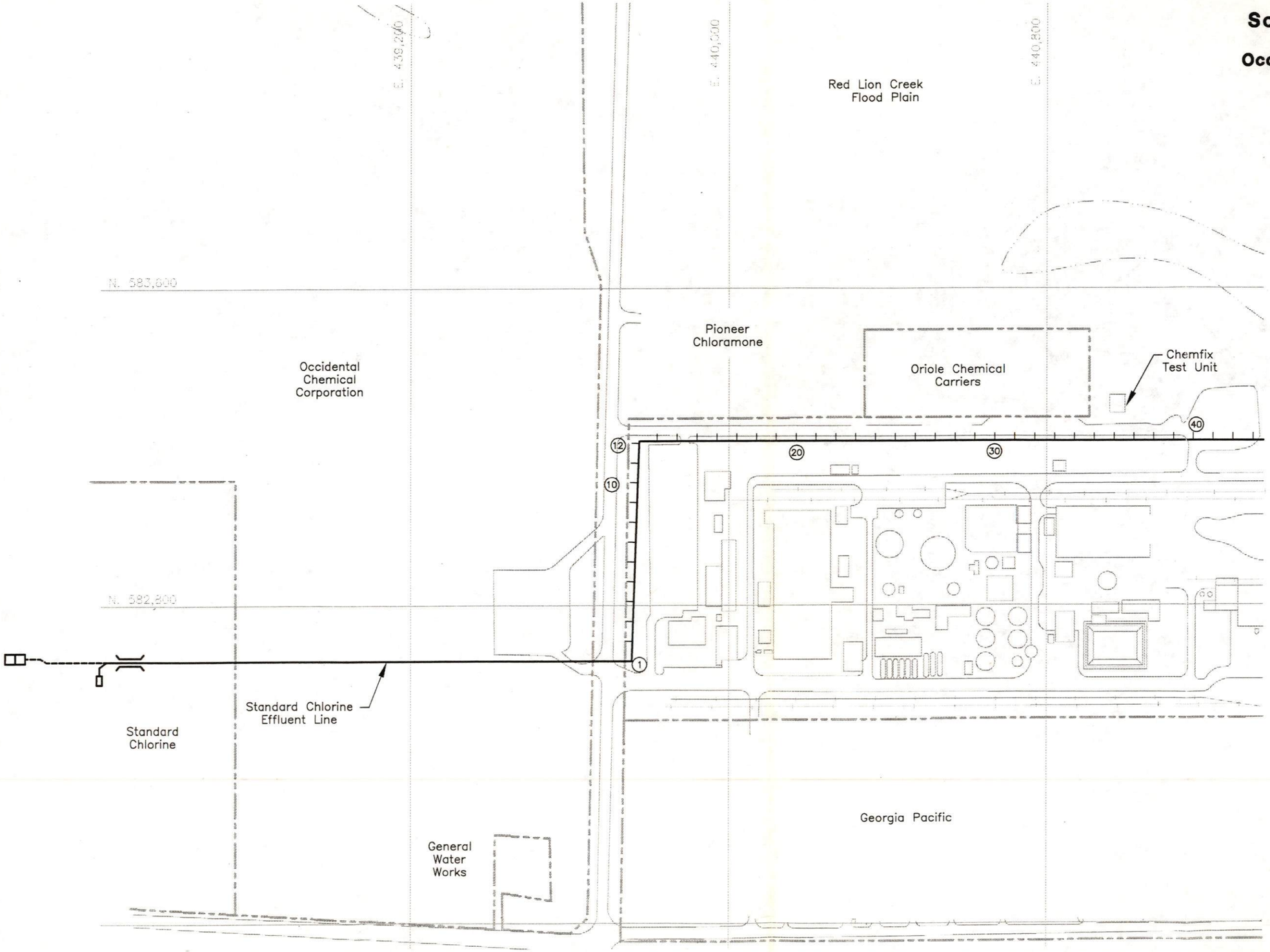
Notes:
1. Ground water values are dissolved concentrations.
2. Waste and soil concentrations are in ug/kg.
3. Ground water concentrations are in ug/L.

Figure 3-7
Distribution of Mercury in Soil, Waste, and Ground Water Samples
Waste Lake 1
Occidental Chemical Corporation
Delaware City, Delaware



Notes:
1. Ground water values are dissolved concentrations.
2. Waste and soil concentrations are in mg/kg.
3. Ground water concentrations are in ug/L.

Figure 3-8
Soil Gas Sample Locations
West Side of Facility
Occidental Chemical Corporation
Delaware City, Delaware



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72209.07.01/04.28.94-MKB/05.18.94-MKB/I207

Figure 3-9
Soil Gas Sample Locations
East Side of Facility
Occidental Chemical Corporation
Delaware City, Delaware

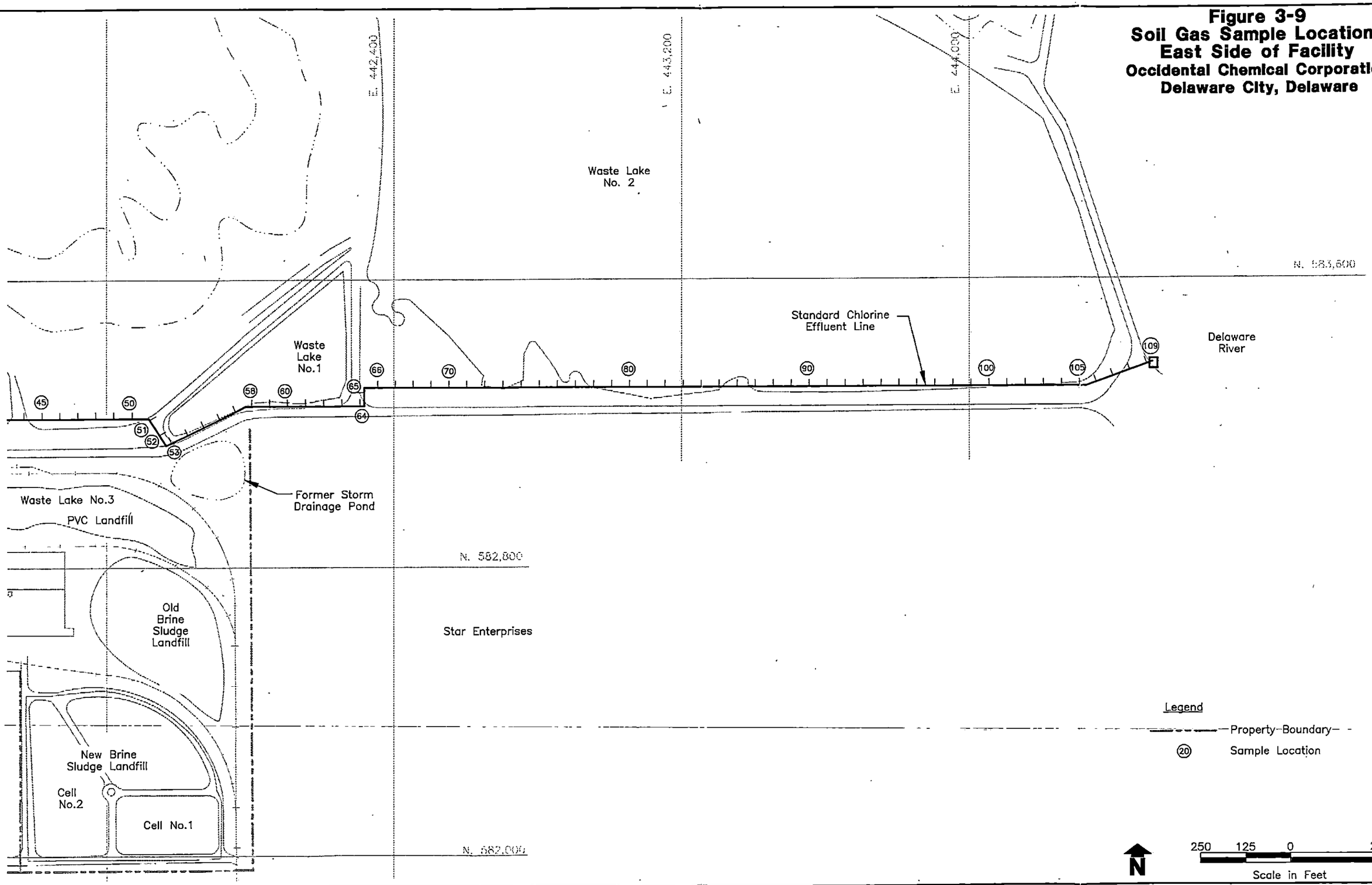

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Figure 3–10
Terrain Conductivity
Waste Lake No. 2
Occidental Chemical Corporation
Delaware City, Delaware

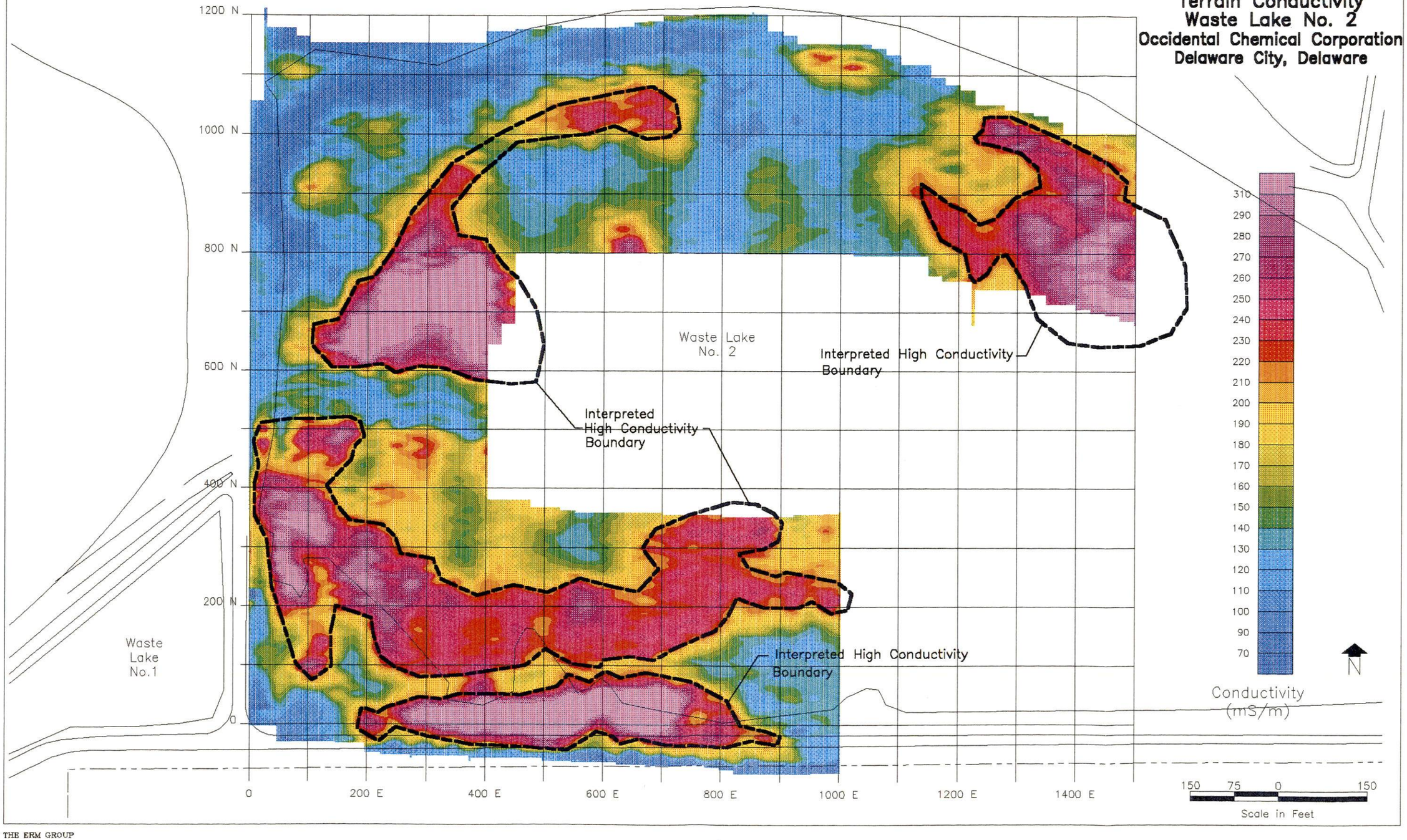

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Figure 3-11
Distribution of Total VOCs and Total SVOCs in Soil, Waste, and and Ground Water Samples
Waste Lake 2
Occidental Chemical Corporation
Delaware City, Delaware

WB-7

	VOCs	SVOCs
2–4'	18	ND
4–6'	8.8	ND
6–8'	20	6,520 J

A-290B

VOCs	SVOCs
3.3	ND

(SB-4)

	VOCs	SVOCs
2–4'	3.4 J	ND
4–6'	ND	ND
6–8'	ND	ND

A-29S

VOCs	SVOCs
ND	ND

6–8'	ND	ND

(SB-4A) VOCs SVOCs

A-29D

VOCs	SVOCs
ND	ND

A-30D

	VOCs	SVOCs
8–10'	ND	ND

(SB-5)

	VOCs	SVOCs
4–6'	3.6 J	ND
6–8'	2.6 J	ND
20–22'	92.0 J	ND

SS-9

VOCs	SVOCs
ND	ND

WB-8

	VOCs	SVOCs
2–4'	2.9 J	1,680 J
4–6'	62	160 J
6–8'	62	450 J

	ND	ND

A-300B VOCs SVOCs

WB-6

	VOCs	SVOCs
2–4'	341,000	10,420 J
4–6'	95,000	42,470 J
6–8'	110,000	388,800 J

WB-9

	VOCs	SVOCs
2–4'	4.3 J	31.3 J
4–6'	ND	ND
6–8'	17.9 J	140 J
8–10'	ND	ND

SS-10

VOCs	SVOCs
ND	ND

SS-8

VOCs	SVOCs
ND	750 J

SS-7

VOCs	SVOCs
ND	ND

Waste Lake No. 2

WB-5

	VOCs	SVOCs
4–6'	ND	ND
6–8'	ND	ND
10–12'	11.1	ND
15–17'	ND	ND

WB-4

	VOCs	SVOCs
0–2'	ND	1,800 J
4–6'	ND	ND
6–8'	7.8 J	ND

WB-3

	VOCs	SVOCs
4–6'	12	ND
6–8'	74 J	ND
10–12'	ND	ND

Former Storm Drainage Pond

N

200 100 0 200

Scale in Feet

Notes:
1. Ground water values are dissolved concentrations.
2. Waste and soil concentrations are in ug/kg.
3. Ground water concentrations are in ug/L.

Legend

- Property Boundary
- Deep Monitoring Well Location
- Shallow Monitoring Well Location
- Waste Boring Location
- Soil Boring Location
- Surface Soil Sample Location
- (SB-4) Deep Soil Boring Location Converted to Monitoring Well
- J Estimated Value
- ND Not Detected

72209.07.01/04.11.94-DST/06.02.94-MKB/1205-2

Figure 3-12
Distribution of Mercury in Soil, Waste, and Ground Water Samples
Waste Lake 2
Occidental Chemical Corporation
Delaware City, Delaware

WB-7
2-4' 5.1
4-6' 31
6-8' 100

A-29OB
ND

(SB-4)
2-4' 0.69 J
4-6' 0.43 J
6-8' 0.27 J

A-29S
ND

6-8' ND
(SB-4A)

ND
A-29D

A-30D
8-10' ND

(SB-5)
4-6' 0.22 J
6-8' ND
20-22' 0.19 J

ND
A-30OB

ND
SS-9

2-4' 16
4-6' 270
6-8' 110
WB-8

2-4' 22
4-6' 23
6-8' 130
WB-6

2-4' 3.6
4-6' 33
6-8' 4.4
8-10' 1.9
WB-9

2.8
SS-10

2.3
SS-8

SS-7
0.65

Waste Lake No. 2

4-6' 0.96
6-8' 0.88
8-10' ND
15-17' 3.2
WB-5

0-2' 9
4-6' 0.3
6-8' 0.96
WB-4

4-6' 0.59
6-8' 18
10-12' 39
WB-3

Former Storm Drainage Pond

N

200 100 0 200
Scale in Feet

Notes:
1. Ground water values are dissolved concentrations.
2. Waste and soil concentrations are in mg/kg.
3. Ground water concentrations are in ug/L.

Legend
- Property Boundary
- Deep Monitoring Well Location
- Shallow Monitoring Well Location
- Waste Boring Location
- Soil Boring Location
- Surface Soil Sample Location
- (SB-1) Deep Soil Boring Location Converted to Monitoring Well
- J Estimated Value
- ND Not Detected

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72209.07.01/04.11.94-DST/06.01.94-MKB/1205-1

Figure 3-13
Distribution of Total VOCs and Total SVOCs in Soil, Waste, and Ground Water Samples
Waste Lake 3
Occidental Chemical Corporation
Delaware City, Delaware

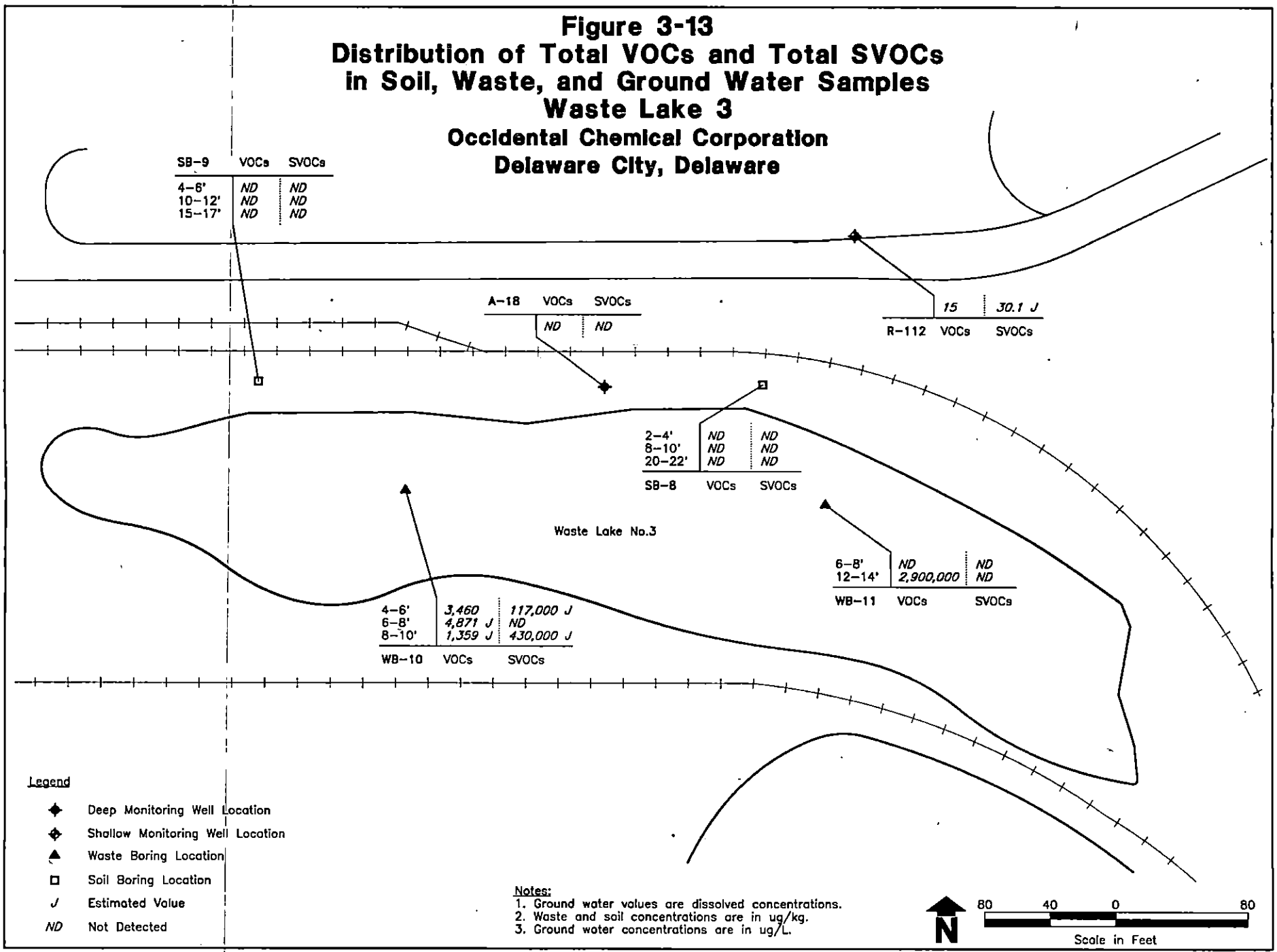
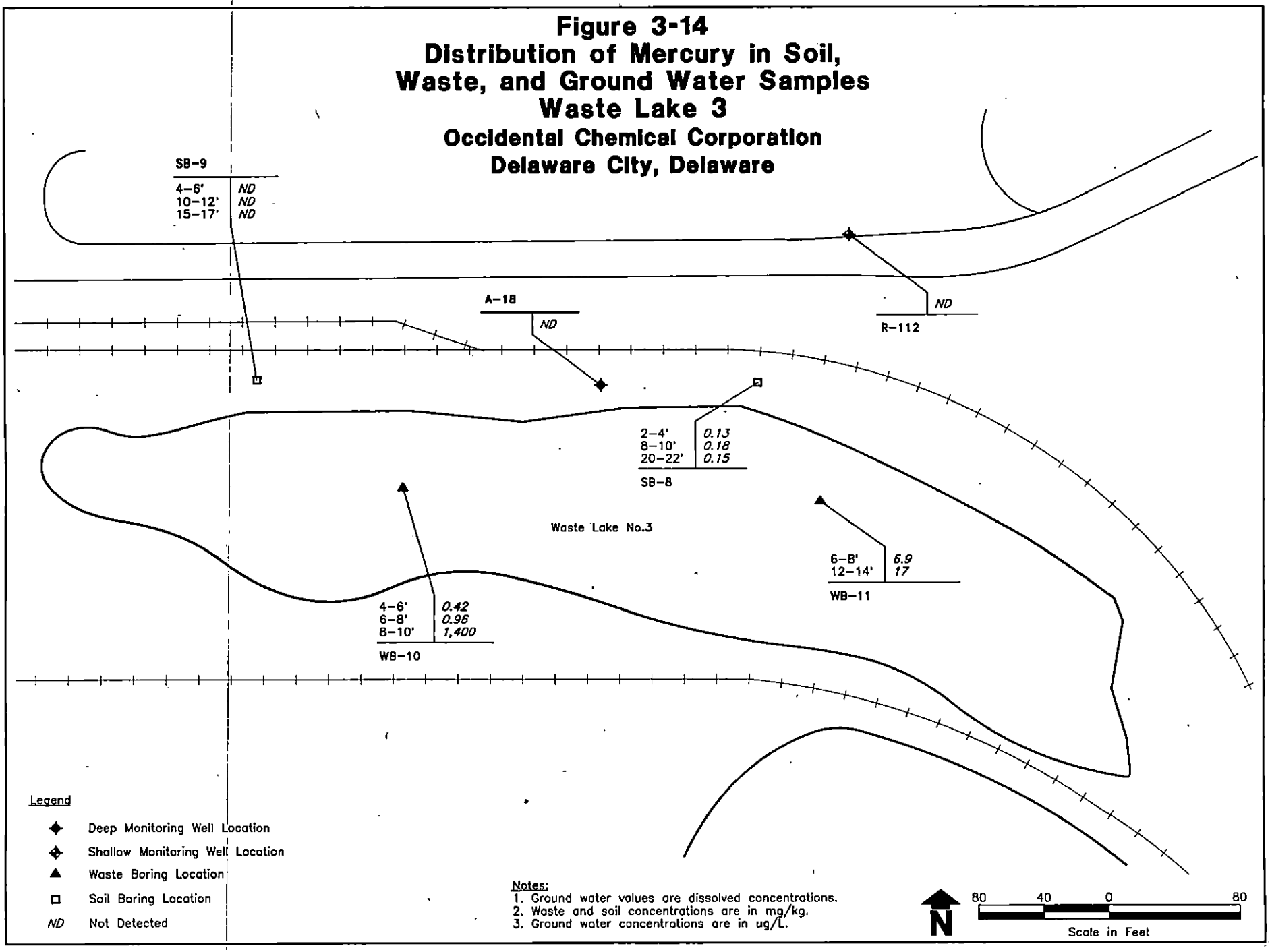


Figure 3-14
Distribution of Mercury in Soil, Waste, and Ground Water Samples
Waste Lake 3
Occidental Chemical Corporation
Delaware City, Delaware



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72209.07.01/05.08.94-MKB/05.17.94-DST/1106-1

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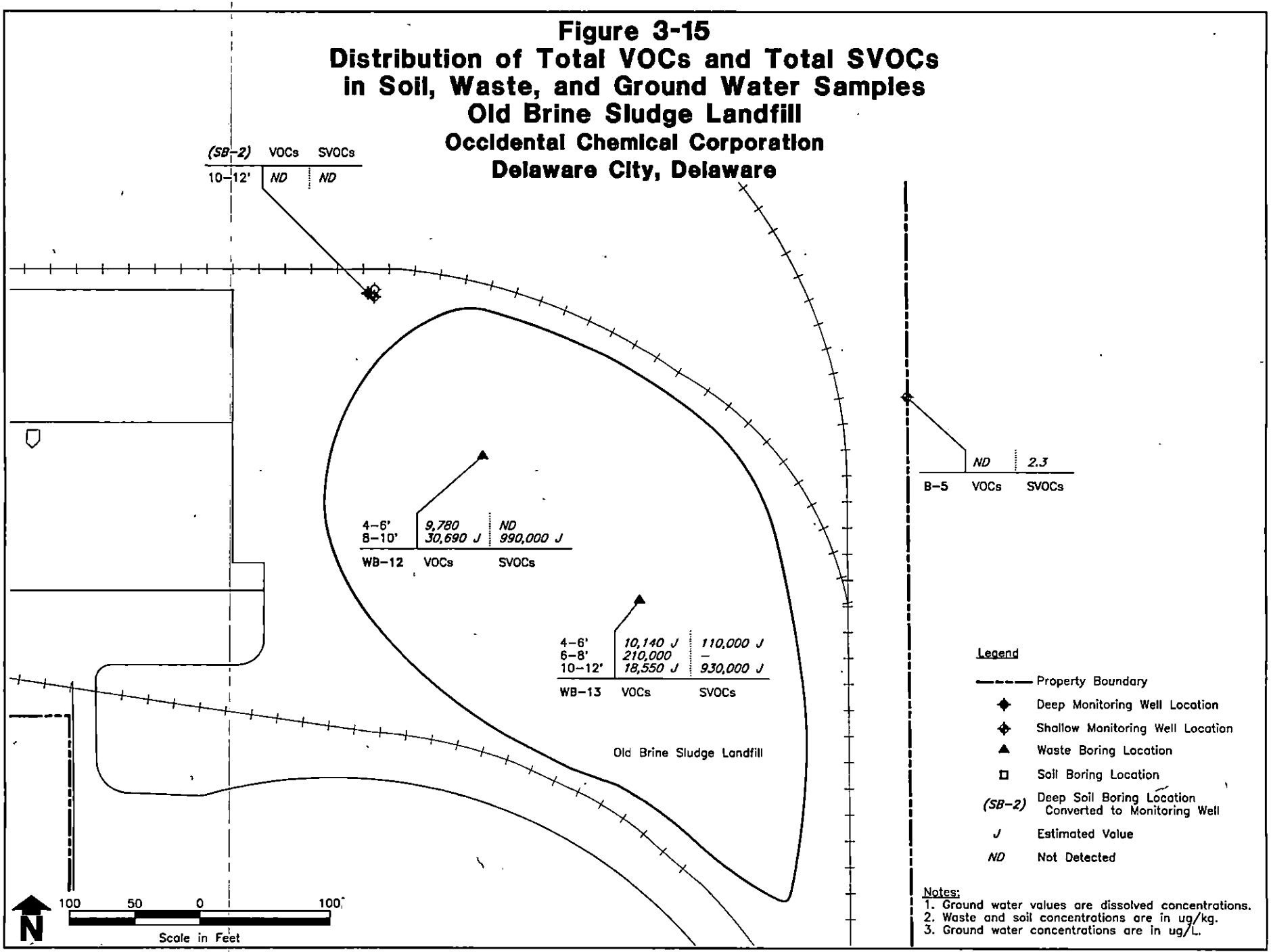
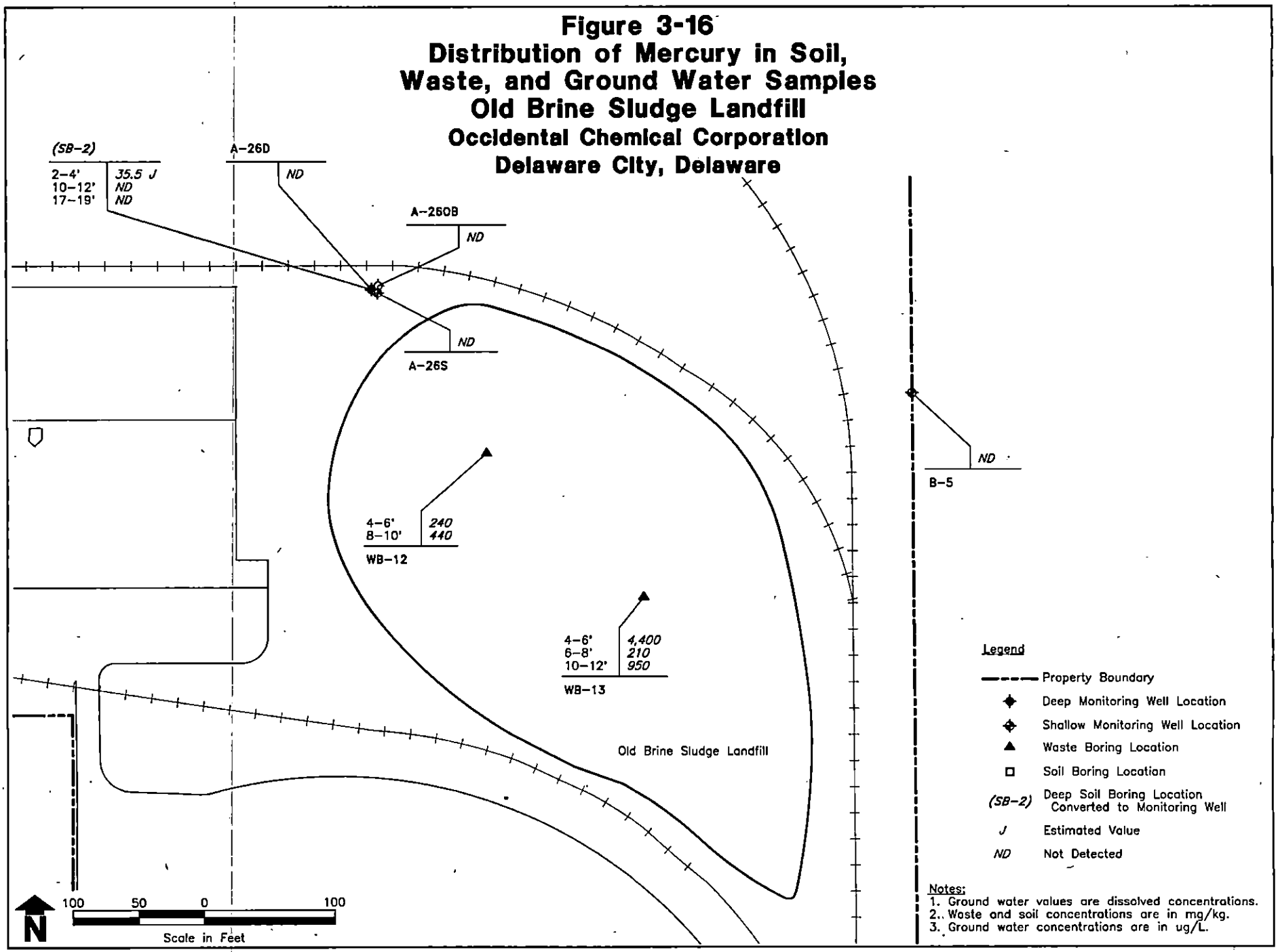
Figure 3-15
Distribution of Total VOCs and Total SVOCs in Soil, Waste, and Ground Water Samples
Old Brine Sludge Landfill
Occidental Chemical Corporation
Delaware City, Delaware



72209.07.01/05.06.94-MKB/06.01.94-MKB/1104-2

Figure 3-16
Distribution of Mercury in Soil, Waste, and Ground Water Samples
Old Brine Sludge Landfill
Occidental Chemical Corporation
Delaware City, Delaware



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72209.07.01/05.06.94-MKB/05.16.94-MKB/1104-1

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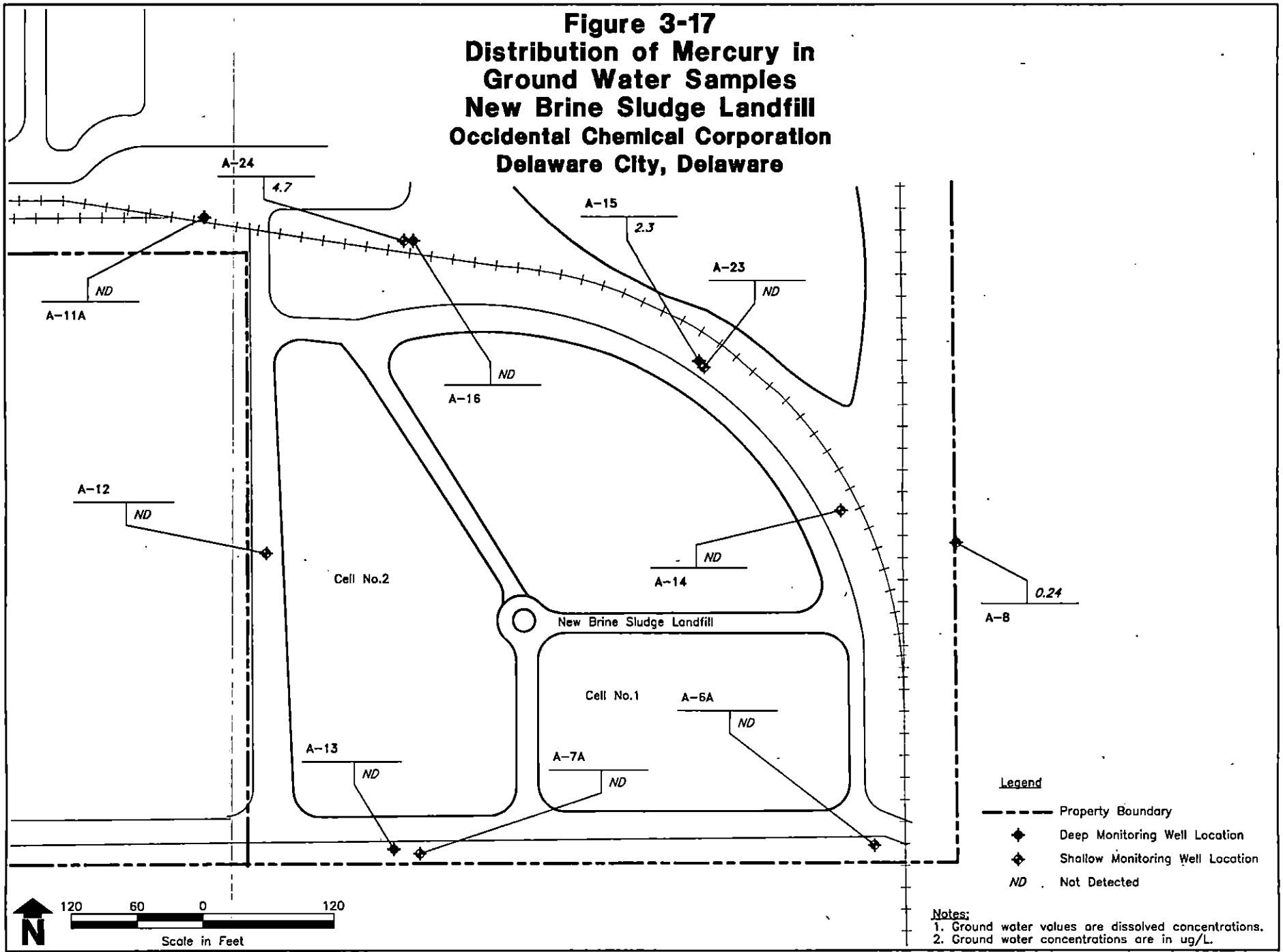
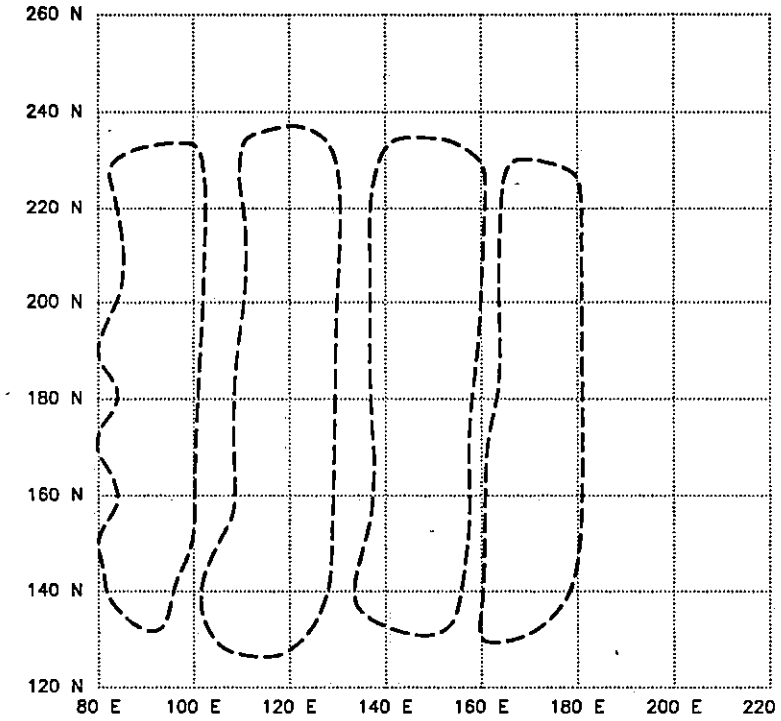
Figure 3-17
Distribution of Mercury in Ground Water Samples
New Brine Sludge Landfill
Occidental Chemical Corporation
Delaware City, Delaware



72209.07.01/05.06.94-MKB/06.01.94-MKB/1105-1

Figure 3-18
Sludge Stabilization Trenches Interpreted Boundary
Chemfix Area
Occidental Chemical Corporation
Delaware City, Delaware



Oriole Chemical Carriers

40 20 0 40

Scale in Feet

N

Legend

Property Boundary

100 N Geophysical Grid

Interpreted Boundary of Sludge Stabilization Trench

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72209.09.01/04.27.94-MKB/05.31.94-MKB/1102

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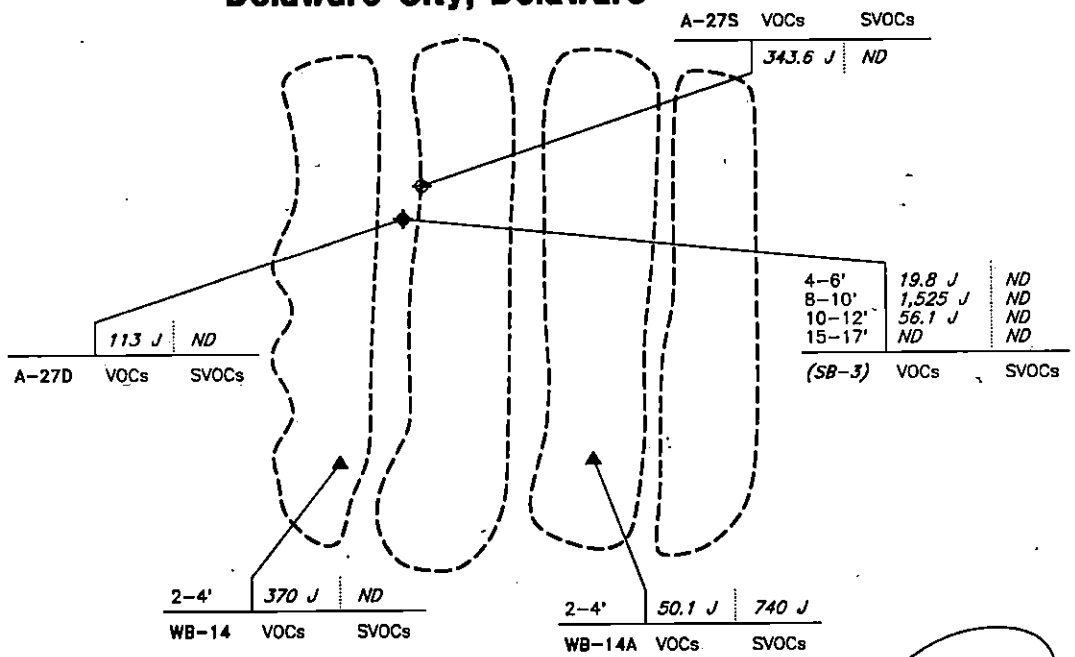
Figure 3-19
Distribution of Total VOCs and Total SVOCs in Soil, Waste, and Ground Water Samples
Chemfix Test Unit
Occidental Chemical Corporation
Delaware City, Delaware



Legend

- Property Boundary
- Deep Monitoring Well Location
- Shallow Monitoring Well Location
- Waste Boring Location
- (SB-3) Deep Soil Boring Location Converted to Monitoring Well
- J Estimated Value
- ND Not Detected
- Interpreted Boundary of Sludge Stabilization Trench

Notes:
1. Ground water values are dissolved concentrations.
2. Waste and soil concentrations are in ug/kg.
3. Ground water concentrations are in ug/L.

N

40 20 0 40
Scale in Feet

72209.07.01/05.06.94-MKB/06.01.94-DST/1107-2

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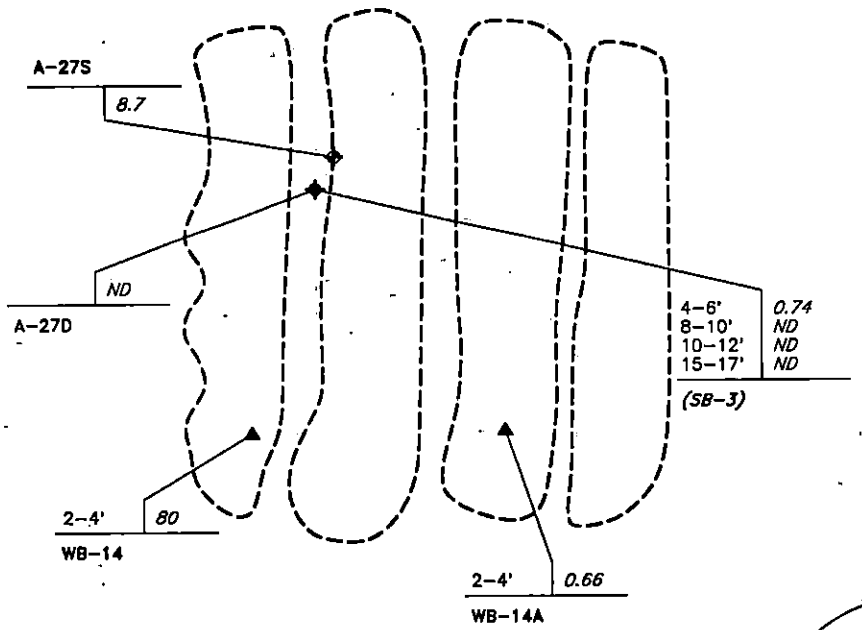
Figure 3-20
Distribution of Mercury in Soil, Waste, and Ground Water Samples
Chemfix Test Unit
Occidental Chemical Corporation
Delaware City, Delaware



Legend

- Property Boundary
- Deep Monitoring Well Location
- Shallow Monitoring Well Location
- Waste Boring Location
- (SB-3) Deep Soil Boring Location Converted to Monitoring Well
- ND Not Detected
- Interpreted Boundary of Sludge Stabilization Trench

Notes:
1. Ground water values are dissolved concentrations.
2. Waste and soil-concentrations are in mg/kg.
3. Ground water concentrations are in ug/L.

N

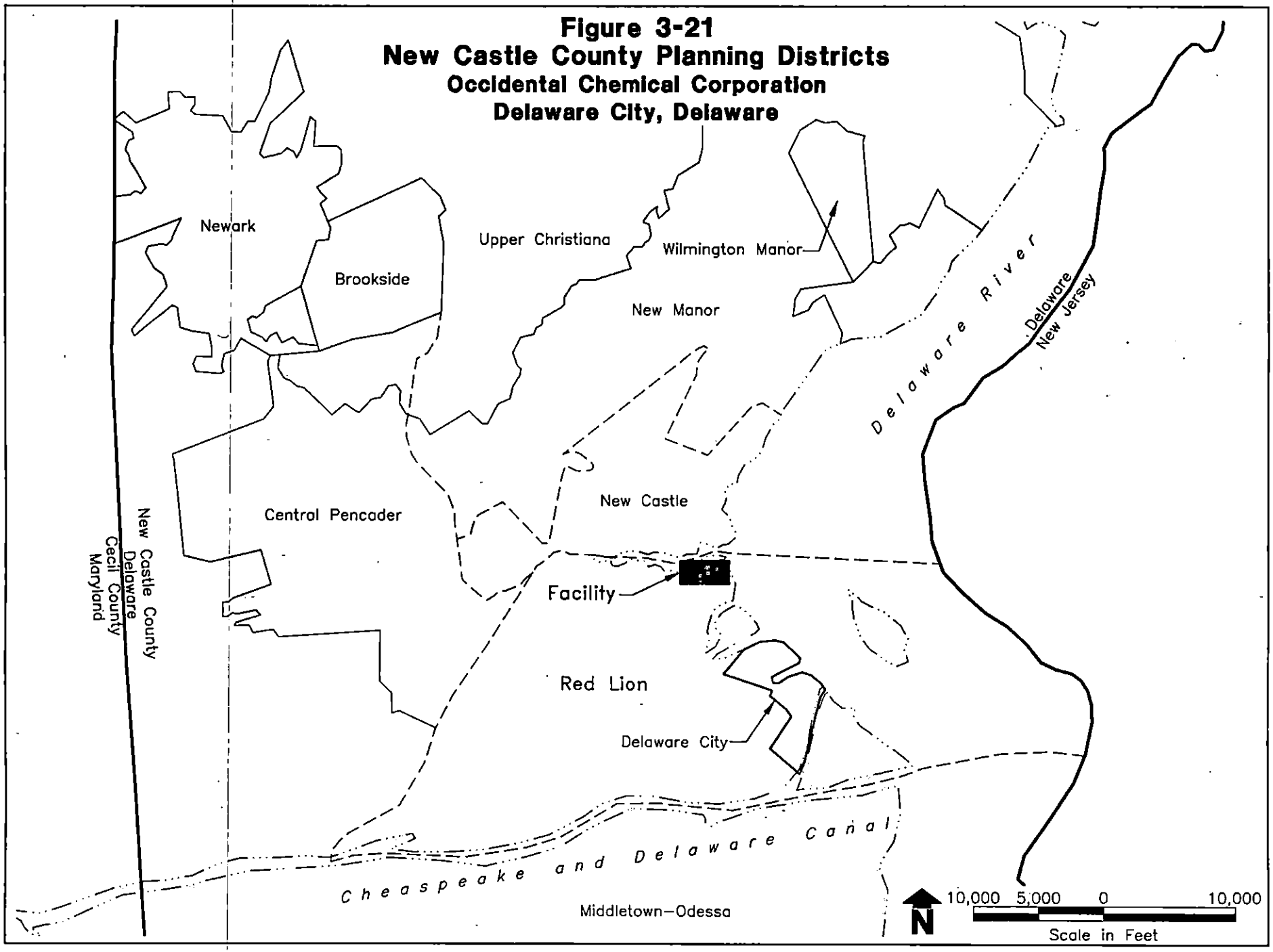
40 20 0 40

Scale in Feet

72209.07.01/05.06.94-MKB/06.01.94-DST/1107-1

THE ERM GROUP

Figure 3-21
New Castle County Planning Districts
Occidental Chemical Corporation
Delaware City, Delaware



72209.07.01/05.09.94-MKB/05.27.94-MKB/B101

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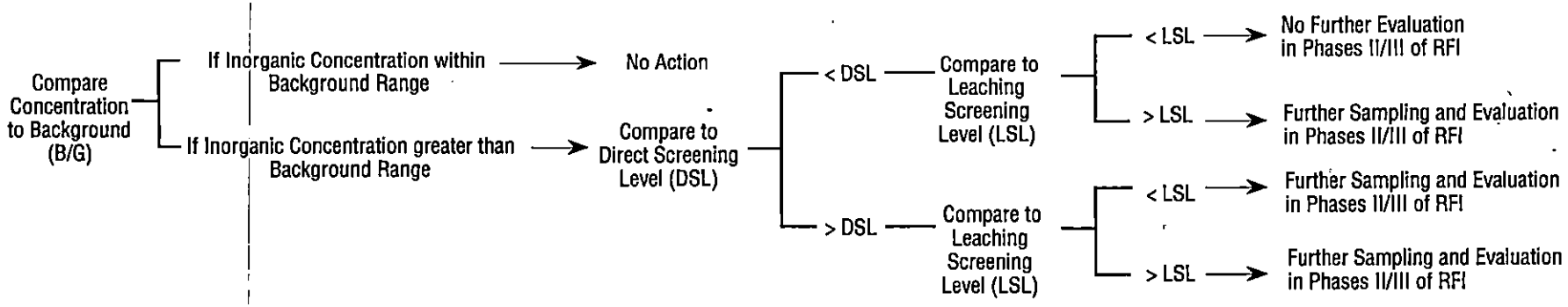
Figure 3-22
Data Review Process for Evaluation of Potential Human Exposures (Soils)
Occidental Chemical Corporation
Delaware City, Delaware



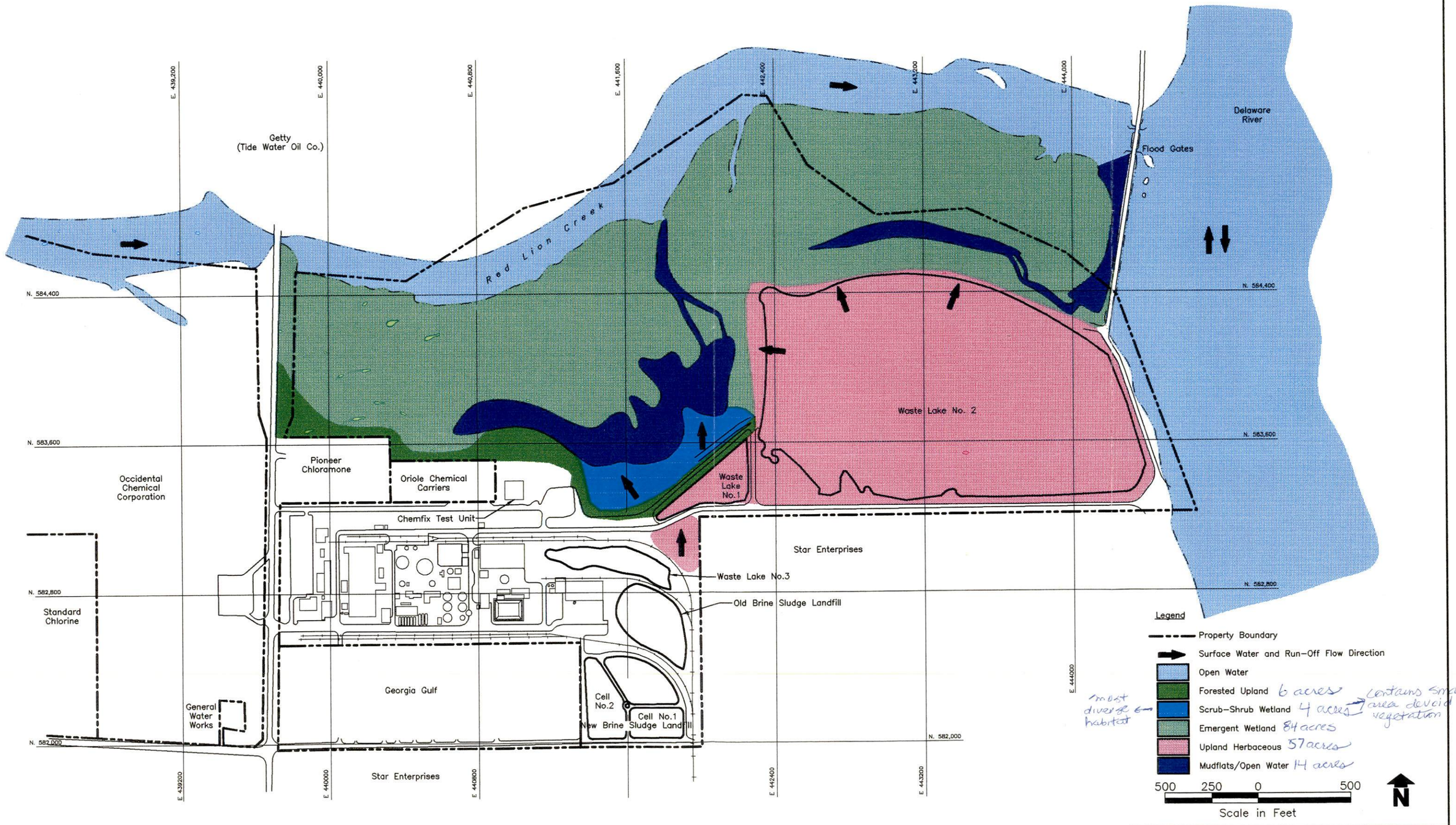
Notes:

1. For soils, the comparison to background pertains only to inorganic constituents. Organic constituents are compared directly to DSLs and LSLs, as shown.

2. Leaching screening levels (LSLs) were derived based on organic carbon partition coefficients or distribution coefficients.

7220/02.01 / REV 5/17/94

Figure 3-23
Habitat Covertype Map
Occidental Chemical Corporation
Delaware City, Delaware



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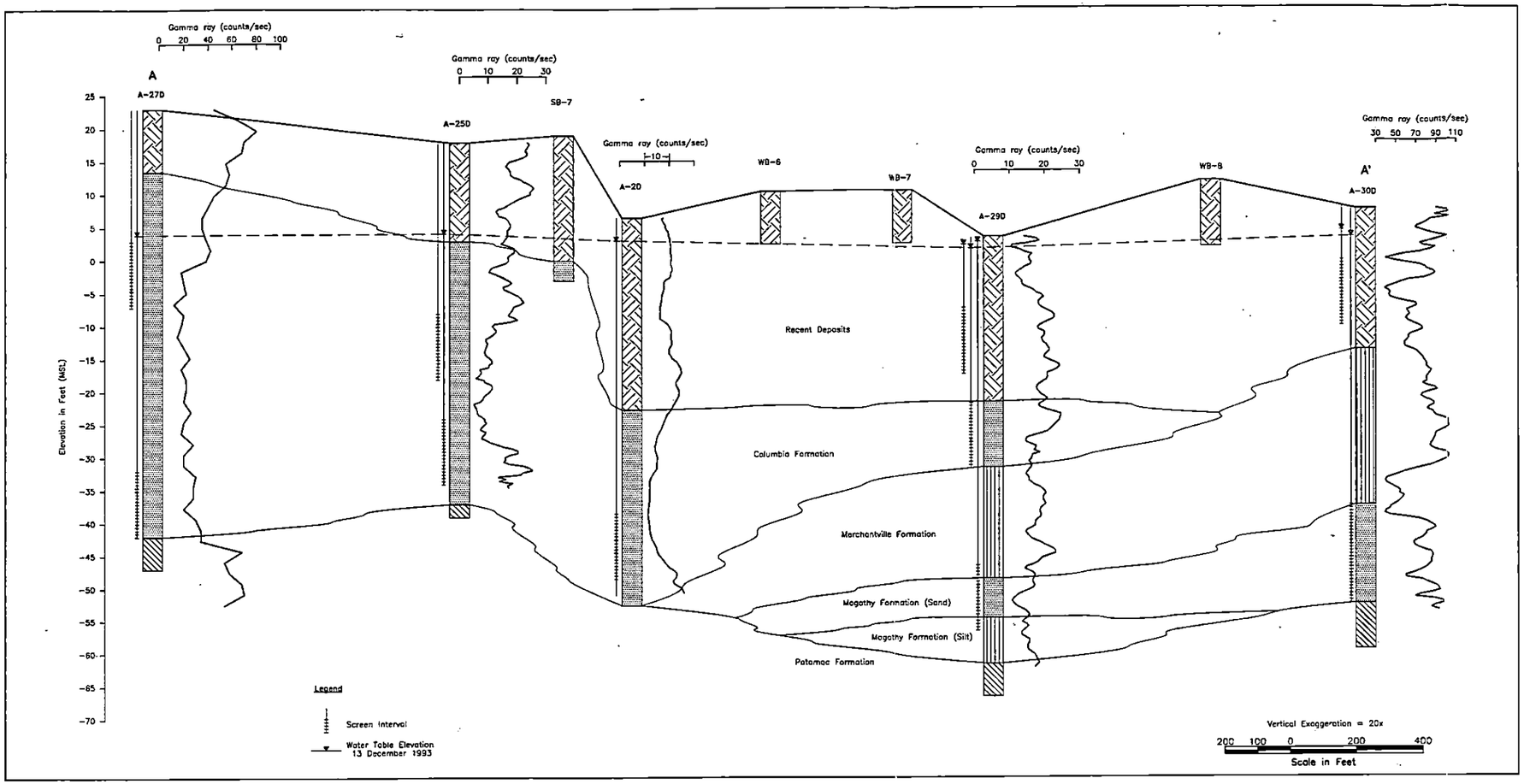
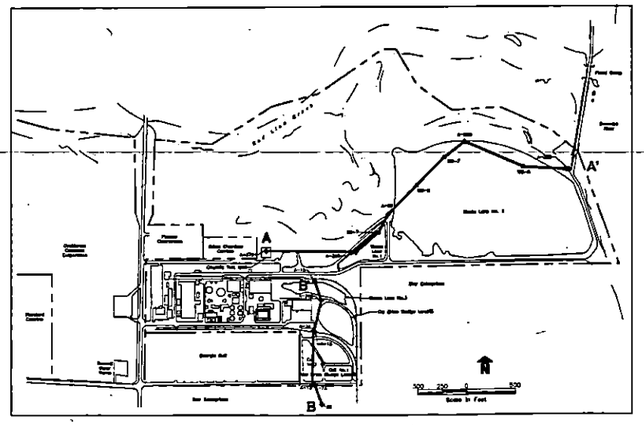
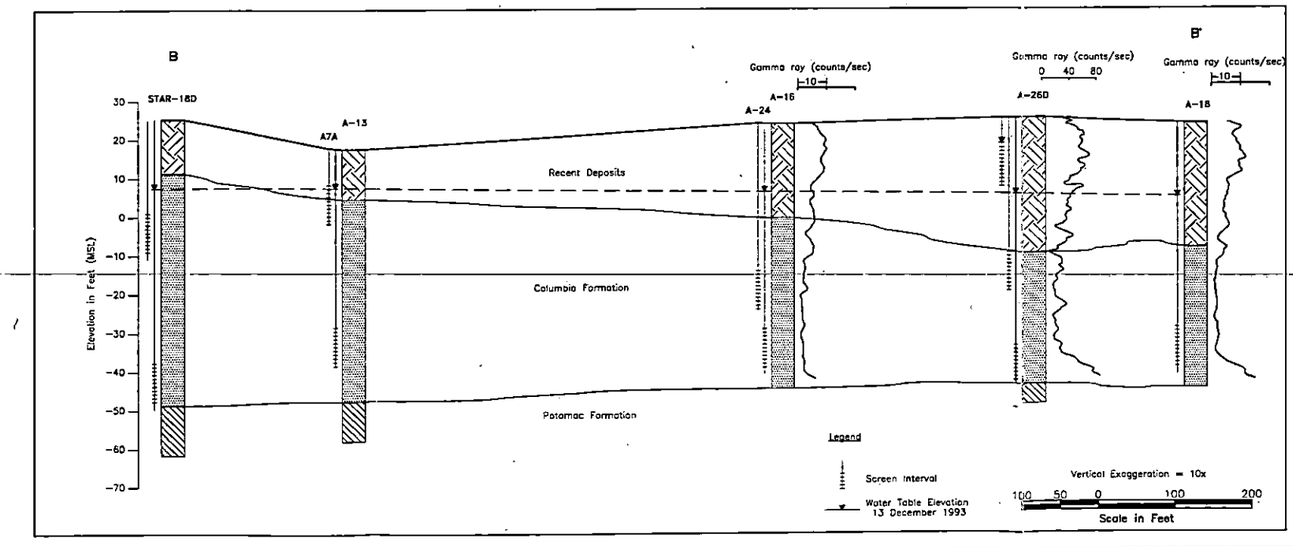
72209.07.01/04.13.94-MKB/05.19.94-MKB/A201

Figure 3-1
Geological Cross Sections
Occidental Chemical Corporation
Delaware City, Delaware



Cross Section Location Map





Section 3 Tables

TABLE 3-1
SUMMARY OF GROUND WATER ELEVATIONS
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/06/94

WELL	DATE 13 DEC 93	11 JAN 94	10 FEB 94	11 MAR 94	11 APR 94
114	2.35	2.48	2.54	3.00	2.72
A-6A	7.55	7.55	7.66	8.45	8.50
A-7A	7.49	1.87	7.77	8.50	8.52
A-08	7.08	7.87	7.18	9.41	8.40
A-11A	6.22	6.18	6.40	7.14	7.00
A-12	6.90	6.97	7.16	7.92	7.86
A-13	7.58	7.56	7.73	8.42	8.49
A-14	6.87	6.94	7.07	8.05	7.84
A-15	6.57	6.64	6.72	7.70	7.45
A-16	6.34	6.34	5.63	7.25	7.16
A-18	5.05	5.13	5.21	6.03	5.77
A-20	2.96	3.71	3.99	4.20	4.13
A-23	6.58	6.61	6.75	7.72	7.48
A-24	6.40	6.37	7.47	7.39	7.18
A-25D	4.10	4.21	4.28	5.00	4.68
A-25S	4.06	4.19	4.24	4.97	4.69
A-26 OB	18.79	18.65	18.70	19.20	19.68
A-26D	5.70	5.81	5.79	6.60	6.32
A-26S	5.58	5.64	5.77	6.63	6.35
A-27D	3.92	4.02	4.07	4.66	4.46
A-27S	3.84	4.05	4.12	4.69	4.47
A-29 OB	2.20	1.82	2.02	2.52	2.16
A-29D	2.64	1.14	1.48	1.70	1.38
A-29S	1.59	1.88	1.88	2.45	2.11
A-30 OB	4.32	4.88	4.56	5.67	5.75
A-30D	3.36	3.62	2.66	3.27	4.15
B-05	5.81	5.85	5.97	7.20	6.69
R-110	5.00	5.24	5.28	6.55	6.10
R-112	4.74	4.85	4.94	5.73	5.45
STAR-18D	7.44	7.42	7.61	8.27	8.18
STAR-18S	7.42	7.43	7.60	8.28	8.39

Table 3-2
Hydraulic Head Differences in Nested Wells
Occidental Chemical Corporation
Delaware City, Delaware

Well Nest	Head Difference: Shallow Columbia-Deep Columbia				
	13-Dec-93	11-Jan-94	10-Feb-94	11-Mar-94	11-Apr-94
A-25	-0.04	-0.02	-0.04	-0.03	0.01
A-26	-0.12	-0.17	-0.02	0.03	0.14
A-27	-0.08	0.03	0.05	0.03	0.34
A-16/A-24	0.06	0.03	1.84	0.14	0.02
A-15/A-23	0.01	-0.03	0.03	0.02	0.03
A-13/A-7A	-0.09	0.02	0.04	-0.80	0.03

Well Nest	Head Difference: Perched Aquifer-Shallow Columbia				
	13-Dec-93	11-Jan-94	10-Feb-94	11-Mar-94	11-Apr-94
A-26	13.21	13.01	12.93	12.57	13.33
A-29	0.61	-0.06	0.14	0.07	0.05

Note: A negative value indicates a higher head in the deeper well and an upward gradient.

TABLE 3-3
HYDRAULIC CONDUCTIVITY SUMMARY
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/17/94

WELL	DATE	AQUIFER	UNITS	CONDUCTIVITY VALUE: SLUG IN	SLUG OUT
114	14 SEP 93	UPPER COLUMBIA	FT/DAY	18.6	21.6
A-08	15 SEP 93	UPPER COLUMBIA	FT/DAY	6.8	NA
A-11A	05 JAN 94	LOWER COLUMBIA	FT/DAY	472.1	445.8
A-12	15 SEP 93	UPPER COLUMBIA	FT/DAY	64.8	72.5
A-13	15 SEP 93	LOWER COLUMBIA	FT/DAY	417.5	NA
A-14	14 SEP 93	UPPER COLUMBIA	FT/DAY	100.2	NA
A-15	14 SEP 93	LOWER COLUMBIA	FT/DAY	413.5	413.5
A-16	14 SEP 93	LOWER COLUMBIA	FT/DAY	-60.6	NA
A-18	13 SEP 93	LOWER COLUMBIA	FT/DAY	164	NA
A-20	14 SEP 93	LOWER COLUMBIA	FT/DAY	33.6	37.3
A-23	14 SEP 93	UPPER COLUMBIA	FT/DAY	35.2	31.8
A-24	14 SEP 93	UPPER COLUMBIA	FT/DAY	0.87	NA
A-25D	06 JAN 94	LOWER COLUMBIA	FT/DAY	26.5	30.0
A-25S	06 JAN 94	UPPER COLUMBIA	FT/DAY	7.5	5.3
A-26 OB	06 JAN 94	SURFACE DEPOSITS	FT/DAY	0.01	NA
A-26D	05 JAN 94	LOWER COLUMBIA	FT/DAY	78.0	66.9
A-26S	05 JAN 94	UPPER COLUMBIA	FT/DAY	30.3	27.3
A-27D	06 JAN 94	LOWER COLUMBIA	FT/DAY	88.7	76.9
A-27S	06 JAN 94	UPPER COLUMBIA	FT/DAY	100.2	100.2
A-29 OB	05 JAN 94	SURFACE DEPOSITS	FT/DAY	0.01	NA
A-29S	05 JAN 94	COLUMBIA	FT/DAY	0.57	NA
A-30 OB	05 JAN 94	SURFACE DEPOSITS	FT/DAY	0.02	NA
A-30D	05 JAN 94	MAGOTHY	FT/DAY	8.3	NA
A-6A	15 SEP 93	UPPER COLUMBIA	FT/DAY	18.6	11.2
A-7A	15 SEP 93	UPPER COLUMBIA	FT/DAY	68.5	NA
B-05	15 SEP 93	UPPER COLUMBIA	FT/DAY	45.7	45.7
R-110	13 SEP 93	UPPER COLUMBIA	FT/DAY	0.04	NA
R-112	13 SEP 93	UPPER COLUMBIA	FT/DAY	3.7	NA

TABLE 3-4
SUMMARY OF ANALYTICAL RESULTS FOR BACKGROUND CONDITIONS
SURFACE SOIL
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID SS-4 DATE COLLECTED 13 SEP 93		SS-5 13 SEP 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q
E.METALS	ARSENIC	MG/KG	4.1		3.5	
	BARIUM	MG/KG	60		48	
	BERYLLIUM	MG/KG	0.89		0.81	
	CHROMIUM	MG/KG	18		17	
	COPPER	MG/KG	13	U	12	
	IRON	MG/KG	14000		14000	
	LEAD	MG/KG	37		26	
	MANGANESE	MG/KG	390	J	240	J
	MERCURY	MG/KG	1.1		1.8	
	NICKEL	MG/KG	16		17	
	ZINC	MG/KG	55	J	42	J
G.PH	PH	PH UNITS	5.1	J	4.7	J
H.MISC	MOISTURE CONTENT	% BY WT.	21		8.2	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	21000		34000	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-4
SUMMARY OF ANALYTICAL RESULTS FOR BACKGROUND CONDITIONS
SOIL BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID SB-6 2-4' DATE COLLECTED 11 NOV 93 AMOUNT	Q	SB-6 8-10' 11 NOV 93 AMOUNT	Q	SB-6 15-17' 11 NOV 93 AMOUNT	Q
E.METALS	ARSENIC	MG/KG	1.8	J	1.0	U	1.1	UJ
	BARIUM	MG/KG	28.5		45.3		22.1	
	CHROMIUM	MG/KG	36.4		17.8		4.3	
	COPPER	MG/KG	5.0		5.9		2.5	U
	IRON	MG/KG	145000	J	12500	J	2720	J
	LEAD	MG/KG	12.0		9.4		3.0	
	MANGANESE	MG/KG	113	J	91.0	J	211	J
	MERCURY	MG/KG	0.23		.091	U	.095	U
	NICKEL	MG/KG	6.2		5.9		4.0	U
	ZINC	MG/KG	17.7	J	15.1	J	10.2	J
G.PH	PH	PH UNITS	6.3	J	5.3	J	5.5	J
H.MISC	MOISTURE CONTENT	% BY WT.	4.5		6.6		7.7	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	1170		398		330	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-4
SUMMARY OF ANALYTICAL RESULTS FOR BACKGROUND CONDITIONS
GROUND WATER
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID			
			STAR-18D		STAR-18S	
			DATE COLLECTED			
			14 DEC 93		14 DEC 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q
E.METALS	SODIUM	UG/L	515000		176000	
E.METALS-DISS	MANGANESE -DISS	UG/L	21.1		135	
	SODIUM -DISS	UG/L	625000		189000	
	ZINC -DISS	UG/L	31.0		35.0	
X.MISC	CHLORIDE	MG/L	931		284	
	SULFATE	MG/L	680		154	
	TOTAL ORGANIC CARBON (TOC)	MG/L	1.6		1.3	
	TOTAL SUSPENDED SOLIDS (TSS)	MG/L	47.0		48.0	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-5
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 1
SURFACE SOIL
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID SS-6 DATE COLLECTED 13 SEP 93 AMOUNT	Q
E.METALS	ARSENIC	MG/KG	2.1	
	BARIUM	MG/KG	64	
	BERYLLIUM	MG/KG	0.59	
	CHROMIUM	MG/KG	12	
	IRON	MG/KG	6900	
	LEAD	MG/KG	19	
	MANGANESE	MG/KG	160	J
	MERCURY	MG/KG	1.5	
	NICKEL	MG/KG	9.2	
	ZINC	MG/KG	33	J
G.PH	PH	PH UNITS	5.4	J
H.MISC	MOISTURE CONTENT	% BY WT.	14	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	17000	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 1
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-1 4-6' DATE COLLECTED 23 SEP 93 AMOUNT	Q	WB-1 8-10' 23 SEP 93 AMOUNT	Q	WB-1 10-12' 23 SEP 93 AMOUNT	Q	WB-1 10-12'(TCLP) 23 SEP 93 AMOUNT	Q
A.VOA	BENZENE	UG/KG	120000	J	390000		1800000		-	
	CHLOROBENZENE	UG/KG	1500000	J	53000	U	3400000		-	
TOTAL CONCENTRATIONS:	VOA		1620000		390000		5200000			
B.SVOA	1,3-DICHLOROBENZENE	UG/KG	140000	J	36000	UR	1700000	J	-	
	1,4-DICHLOROBENZENE	UG/KG	1600000	J	160000	J	9500000	J	-	
	1,2-DICHLOROBENZENE	UG/KG	1200000	J	160000	J	7000000	J	-	
	1,2,4-TRICHLOROBENZENE	UG/KG	300000	J	17000	J	1700000	UR	-	
TOTAL CONCENTRATIONS:	SVOA		3240000		337000		18200000			
E.METALS	ARSENIC	MG/KG	2.1		1.8	U	2.7		-	
	BARIUM	MG/KG	2400	J	8700		6300	J	-	
	CADMIUM	MG/KG	1.2		1.0		0.86	U	-	
	CHROMIUM	MG/KG	41		34		72		-	
	IRON	MG/KG	4800		2400		3700		-	
	LEAD	MG/KG	31		23		30		-	
	MANGANESE	MG/KG	53		29		32		-	
	MERCURY	MG/KG	2700		3400		1300		-	
	NICKEL	MG/KG	14		4.6	U	4.3	U	-	
	SILVER	MG/KG	1.6	U	1.8	U	2.1		-	
	SODIUM	MG/KG	2000		1400		1300		-	
	ZINC	MG/KG	250		160		140		-	
H.MISC	MOISTURE CONTENT	% BY WT.	36		45		42		-	
	PH	PH UNITS	7.7		8.0		8.3	J	-	
	PHENOLICS, TOTAL	MG/KG	4.5		9.3		7.3		-	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-5
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 1
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID							
			WB-1 4-6'		WB-1 8-10'		WB-1 10-12'		WB-1 10-12'(TCLP)	
			DATE COLLECTED							
			23 SEP 93		23 SEP 93		23 SEP 93		23 SEP 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q
H.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	9400		6500		8800		-	
M.TCLP VOA	BENZENE (TCLP)	MG/L	-		-		-		69	
	CHLOROBENZENE (TCLP)	MG/L	-		-		-		69	
N.TCLP SVOA	1,4-DICHLOROBENZENE (TCLP)	UG/L	-		-		-		18	
O.TCLP METALS	BARIUM (TCLP)	MG/L	-		-		-		0.325	
	CHROMIUM (TCLP)	MG/L	-		-		-		0.014	
	MERCURY (TCLP)	MG/L	-		-		-		0.001	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 1
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-2 8-10' DATE COLLECTED 22 SEP 93 AMOUNT Q	WB-2 12-14' 22 SEP 93 AMOUNT Q	WB-2 12-14' TCLP 22 SEP 93 AMOUNT Q	WB-2 14-16' 22 SEP 93 AMOUNT Q
A.VOA	VINYL CHLORIDE	UG/KG	100 U	24000 U	-	90000
	1,2-DICHLOROETHENE, TOTAL	UG/KG	270	12000 U	-	13000 U
	TRICHLOROETHENE	UG/KG	30 J	12000 U	-	13000 U
	BENZENE	UG/KG	290	130000	-	210000
	CHLOROBENZENE	UG/KG	310	210000	-	350000
	TOTAL CONCENTRATIONS: VOA		900	340000		650000
B.SVOA	1,3-DICHLOROBENZENE	UG/KG	6700 U	20000 J	-	28000 J
	1,4-DICHLOROBENZENE	UG/KG	10000	270000	-	850000 J
	1,2-DICHLOROBENZENE	UG/KG	17000	290000	-	740000 J
	1,2,4-TRICHLOROBENZENE	UG/KG	3700 J	49000	-	170000 J
	HEXACHLOROBENZENE	UG/KG	6300 J	24000 U	-	40000 J
	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	8100 J	6100 J	-	70000 UJ
	TOTAL CONCENTRATIONS: SVOA		45100	635100		1828000
E.METALS	ARSENIC	MG/KG	4.8	2.4	-	2.3
	BARIUM	MG/KG	2600	3700	-	5000
	CADMIUM	MG/KG	6.9	2.1	-	1.1 U
	CHROMIUM	MG/KG	1300	98	-	5.3 U
	COPPER	MG/KG	500	92	-	46
	IRON	MG/KG	18000	7300	-	3300
	LEAD	MG/KG	220	55	-	24
	MANGANESE	MG/KG	260	150	-	27
	MERCURY	MG/KG	42000	13000	-	3400
	NICKEL	MG/KG	110	40	-	9.8
	SILVER	MG/KG	9.6	2.6	-	2.1 U

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-5
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 1
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-2 8-10' DATE COLLECTED 22 SEP 93 AMOUNT	Q	WB-2 12-14' 22 SEP 93 AMOUNT	Q	WB-2 12-14' TCLP 22 SEP 93 AMOUNT	Q	WB-2 14-16' 22 SEP 93 AMOUNT	Q
E.METALS	SODIUM	MG/KG	2600		5100		-		13000	
	ZINC	MG/KG	1700		490		-		85	
H.MISC	MOISTURE CONTENT	% BY WT.	50		46		-		53	
	PH	PH UNITS	8.3	J	8.9	J	-		9.4	J
	PHENOLICS, TOTAL	MG/KG	0.500	U	1.20		-		2.23	
	TOTAL ORGANIC CARBON (TOC)	MG/KG	48000		17000		-		11000	
M.TCLP VOA	BENZENE (TCLP)	MG/L	-		-		2.40		-	
	CHLOROBENZENE (TCLP)	MG/L	-		-		1.40		-	
N.TCLP SVOA	1,4-DICHLOROBENZENE (TCLP)	UG/L	-		-		0.190		-	
O.TCLP METALS	BARIUM (TCLP)	MG/L	-		-		4.14		-	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 1
SOIL BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID SB-1 6-8' DATE COLLECTED 28 OCT 93 AMOUNT	Q	SB-1 8-10' 28 OCT 93 AMOUNT	Q	SB-1 10-12' 28 OCT 93 AMOUNT	Q	SB-1 20-22' 28 OCT 93 AMOUNT	Q	SB-1A 20-22' 09 NOV 93 AMOUNT	Q
A.VOA	VINYL CHLORIDE	UG/KG	11	U	12	U	12	U	12	U	1700	
	BENZENE	UG/KG	5.5	U	6.0	U	6.1	U	15		25000	
	CHLOROBENZENE	UG/KG	5.5	U	2.8	J	9.3		25		1400	
	2-CHLOROETHYLVINYL ETHER	UG/KG	11	U	12	U	12	U	12	U	59	J
	TOTAL CONCENTRATIONS: VOA				2.8		9.3		40		28159	
B.SVOA	1,3-DICHLOROBENZENE	UG/KG	360	U	400	U	400	U	180	J	250	J
	1,4-DICHLOROBENZENE	UG/KG	360	U	400	U	400	U	4400		4900	
	1,2-DICHLOROBENZENE	UG/KG	360	U	400	U	400	U	2500		3700	
	1,2,4-TRICHLOROBENZENE	UG/KG	360	U	400	U	400	U	230	J	630	
	TOTAL CONCENTRATIONS: SVOA								7310		9480	
E.METALS	ARSENIC	MG/KG	2.4	J	4.2	J	3.7	J	1.2	UJ	2.7	
	BARIUM	MG/KG	37.0		41.9		50.2		61.4		50.5	
	BERYLLIUM	MG/KG	0.50	U	0.50	U	0.50	U	0.50	U	0.63	
	CHROMIUM	MG/KG	9.2	J	21.2	J	18.2	J	7.1	J	19.3	
	COPPER	MG/KG	5.1		10.1		8.9		27.5		9.5	
	IRON	MG/KG	9940	J	23800	J	19200	J	9180	J	19100	
	LEAD	MG/KG	8.2		18.6		14.1		8.3		15.2	
	MANGANESE	MG/KG	128		132		128		55.8		120	J
	MERCURY	MG/KG	0.46	J	1.7	J	0.36	J	.10	UJ	3.1	J
	NICKEL	MG/KG	6.6		9.1		9.2		4.0	U	10.3	
	SODIUM	MG/KG	500	U	500	U	500	U	1360		1870	
	ZINC	MG/KG	14.9	J	28.4	J	30.2	J	9.5	J	25.7	
G.PH	PH	PH UNITS	7.7	J	7.0	J	6.1	J	5.4	J	6.1	J
H.MISC	MOISTURE CONTENT	% BY WT.	8.4		17.3		17.4		13.2		15.6	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-5
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 1
SOIL BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID / DATE COLLECTED	SB-1 6-8' 28 OCT 93		SB-1 8-10' 28 OCT 93		SB-1 10-12' 28 OCT 93		SB-1 20-22' 28 OCT 93		SB-1A 20-22' 09 NOV 93	
				AMOUNT	Q	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG		460		1010		666		382		601	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 1
SOIL BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID - SB-7 2-4' DATE COLLECTED 21 OCT 93 AMOUNT	Q	SB-7 8-10' 21 OCT 93 AMOUNT	Q	SB-7 15-17' 21 OCT 93 AMOUNT	Q
A.VOA	BENZENE	UG/KG	5.5	U	6.0	U	8.9	
	CHLOROBENZENE	UG/KG	5.5	U	3.2	J	34	
TOTAL CONCENTRATIONS: VOA					3.2		42.9	
E.METALS	ARSENIC	MG/KG	4.7		2.3		2.3	
	BARIUM	MG/KG	53		44		40	
	CADMIUM	MG/KG	1.5		0.91		0.62	
	CHROMIUM	MG/KG	21		20		14	
	IRON	MG/KG	21000		21000		13000	
	LEAD	MG/KG	17		16		8.6	
	MANGANESE	MG/KG	120		140		79	
	MERCURY	MG/KG	0.10	U	0.13		2.0	
	NICKEL	MG/KG	9.5		9.0		6.5	
	SODIUM	MG/KG	610		1100		1600	
	ZINC	MG/KG	29		28		16	
G.PH	PH	PH UNITS	6.7	J	6.0	J	5.7	J
H.MISC	MOISTURE CONTENT	% BY WT.	8.6		16		15	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	1700		1300		740	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-C
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 1
GROUND WATER
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID 114 DATE COLLECTED 17 DEC 93 AMOUNT	Q	A-20 20 DEC 93 AMOUNT	Q	A-25D 21 DEC 93 AMOUNT	Q	A-25S 21 DEC 93 AMOUNT	Q	R-110 20 DEC 93 AMOUNT	Q
A.VOA	VINYL CHLORIDE	UG/L	10000	U	10000	U	20	UJ	500	UJ	26	J
	CHLOROFORM	UG/L	5000	U	5000	U	10	UJ	250	UJ	12	J
	BENZENE	UG/L	62000		4700	J	96	J	6400	J	68	
	CHLOROBENZENE	UG/L	170000		91000		250	J	4800	J	170	
	METHYLENE CHLORIDE	UG/L	10000	U	10000	U	3.0	B	140	J	50	U
TOTAL CONCENTRATIONS: VOA			232000		95700		346		11340		276	
B.SVOA	1,3-DICHLOROBENZENE	UG/L	1800	J	5000	U	76	J	110	J	9.6	J
	1,4-DICHLOROBENZENE	UG/L	22000		22000		1300		2500		170	
	1,2-DICHLOROBENZENE	UG/L	18000		15000		1300		1400		140	
	1,2,4-TRICHLOROBENZENE	UG/L	3300	J	5000	U	58	J	52	J	5.4	J
	BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	5000	U	5000	U	62	J	200	U	20	U
TOTAL CONCENTRATIONS: SVOA			45100		37000		2796		4062		325	
E.METALS	ARSENIC	UG/L	10	UJ	10	U	10	U	10	UJ	1020	
	BARIUM	UG/L	200	U	261		200	U	200	U	355	
	CADMIUM	UG/L	5.0	U	7.3		5.0	U	5.0	U	5.0	U
	CHROMIUM	UG/L	10	U	10	U	12.5		10	U	396	
	COPPER	UG/L	25	U	25	U	25	U	25	U	239	
	IRON	UG/L	517		3030		100	U	3950		342000	
	LEAD	UG/L	4.5	J	18.7		3.0	U	3.0	UJ	35.0	J
	MANGANESE	UG/L	48.3		369		46200		13400		1640	
	MERCURY	UG/L	54.3		0.2	U	20.3		3.6		248	
	NICKEL	UG/L	40	U	40	U	40	U	40	U	192	
	SODIUM	UG/L	1140000	J	17400		163000	J	596000	J	1690000	J
	ZINC	UG/L	33.4	J	35.9	J	32.5		22.0		683	J
E.METALS-DISS	ARSENIC -DISS	UG/L	10	UJ	10	UJ	10	U	10	U	650	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-5
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 1
GROUND WATER MONITORING PROGRAM
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID									
			114		A-20		A-25D		A-25S		R-110	
			DATE COLLECTED									
			17 DEC 93		20 DEC 93		21 DEC 93		21 DEC 93		20 DEC 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q
E.METALS-DISS	BARIUM -DISS	UG/L	200	U	317		200	U	200	U	200	U
	IRON -DISS	UG/L	100	U	672		311		5900		1390	
	MANGANESE -DISS	UG/L	39.7		383		38700		13400		128	
	MERCURY -DISS	UG/L	64.1		0.2	U	15.2		0.44		4.8	
	SODIUM -DISS	UG/L	1290000		21600		173000		650000		2280000	
	ZINC -DISS	UG/L	25.0		86.9		24.2		23.3		39.7	
X.MISC	CHLORIDE	MG/L	1230		105		177		822		2290	
	PHENOLICS, TOTAL	MG/L	0.014		0.19		0.0057		0.005	U	0.0074	
	SULFATE	MG/L	1260		5.0	U	531		371		578	
	TOTAL ORGANIC CARBON (TOC)	MG/L	54.0		26.0		14.0		7.7		74.0	
	TOTAL SUSPENDED SOLIDS (TSS)	MG/L	17.0		14.0		17.0		157		1370	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

Table 3-6
Soil Gas Survey Results
Occidental Chemical Corporation
Delaware City, Delaware

		Gas Chromatograph Results (ppb*)				OVA Results (ppm)	
Sample ID	Depth (feet)	BENZENE	TOLUENE	XYLENE	UNKNOWNS	Peak	Stable
SG-1	3	-	-	-	13	20	12
SG-2	3	-	36	-	14	18	12
SG-3	3	-	-	-	15	18	10
SG-4	3	-	-	-	15	12	4
SG-5	3	-	-	-	43	22	6
SG-6	3	-	-	-	41	20	6
SG-7	3	-	-	-	38	28	8
SG-8	3	-	78	-	55	34	8
SG-8DUP	3	-	25	-	32	na	na
SG-9	3	-	-	-	20	12	10
SG-10	3	-	-	-	79	20	6
SG-11	3	-	-	-	44	20	8
SG-12	3	-	-	-	81	12	6
SG-13	3	-	-	-	71	10	4
SG-14	3	-	-	-	34	30	8
SG-15	3	-	-	-	77	100	10
SG-16	1.5	-	-	-	43	18	6
SG-17	3	-	-	-	29	10	4
SG-18	3	-	-	-	110	70	10
SG-19	3	-	-	-	50	20	4
SG-20	3	-	-	-	129	98	7
SG-21	3	-	-	-	94	32	6
SG-22	3	-	-	-	30	10	4
SG-23	3	-	-	-	7	8	3
SG-24	3	-	-	-	6	7	3
SG-25	3	-	-	-	59	58	8
SG-26	3	-	-	-	148	32	4
SG-27	3	-	-	-	27	40	5
SG-28	3	-	-	-	158	58	6
SG-29	3	-	-	-	47	45	6
SG-30	3	-	-	-	34	50	7
SG-31	3	-	-	-	113	42	7
SG-32	3	-	-	-	15	30	4
SG-33	3	-	-	-	62	14	4
SG-34	3	-	-	-	21	34	6
SG-35	3	-	-	-	56	14	4
SG-36	3	-	-	-	40	30	6
SG-37	3	-	-	-	76	12	4
SG-38	3	-	-	-	22	30	6
SG-39	3	-	-	-	267	26	7
SG-40	3	-	-	-	39	26	4
SG-41	3	-	-	-	198	14	4
SG-42	3	-	-	-	42	12	4
SG-43	3	-	-	-	172	14	4
SG-44	2.5	6	-	-	79	62	8
SG-44DUP	2	6	-	-	156	na	na
SG-45	2	36	-	26	85	60	12
SG-46	2	10	-	3	134	42	10
SG-47	2	7	-	7	66	58	12
SG-48	2	-	-	-	99	58	10
SG-49	2	-	-	-	37	32	20
SG-50	2	2	-	-	109	68	6
SG-51	3	-	-	-	90	16	6
SG-52	3	4	-	2	275	180	12
SG-53	3	-	-	-	85	20	6
SG-54	3	-	-	-	118	44	8
SG-55	3	-	-	-	61	18	6
SG-56	3	10	2	-	85	84	18
SG-57	3	-	-	-	93	74	22
SG-58	3	-	-	-	35	88	12
SG-59	3	-	-	-	262	120	20
SG-60	3	3	-	-	106	98	14
SG-61	3	-	-	-	37	18	6
SG-62	2	-	-	-	99	104	30
SG-63	2	-	-	-	92	38	8
SG-64	2	2	-	-	156	110	30
SG-65	3	3	-	-	161	460	30
SG-66	2	-	-	-	176	110	36

Notes: "-" indicates non-detected
"na" indicates not analyzed
Unknowns - Unidentified light molecular weight compound
"*" Results are reported as parts per billion as compared to the response of the aqueous standard

TABLE 3-
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
SURFACE SOIL
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID SS-7 DATE COLLECTED 13 SEP 93 AMOUNT	Q	SS-8 13 SEP 93 AMOUNT	Q	SS-9 13 SEP 93 AMOUNT	Q	SS-10 13 SEP 93 AMOUNT	Q
B.SVOA	1,4-DICHLOROBENZENE	UG/KG	390	U	130	J	380	U	410	U
	1,2-DICHLOROBENZENE	UG/KG	390	U	260	J	380	U	410	U
	1,2,4-TRICHLOROBENZENE	UG/KG	390	U	360	J	380	U	410	U
	TOTAL CONCENTRATIONS: SVOA				750					
E.METALS	ARSENIC	MG/KG	2.7		2.3		1.8		3.6	
	BARIUM	MG/KG	60		50		36		82	
	BERYLLIUM	MG/KG	0.63		0.62	U	0.60		0.81	
	CHROMIUM	MG/KG	13		9.9		14		16	
	IRON	MG/KG	10000		6900		8100		12000	
	LEAD	MG/KG	21		22		10		27	
	MANGANESE	MG/KG	160	J	1700	J	100	J	4200	J
	MERCURY	MG/KG	0.65		2.3		0.21	U	2.8	
	NICKEL	MG/KG	7.0		15		7.3		23	
	ZINC	MG/KG	30	J	110	J	21	J	180	J
G.PH	PH	PH UNITS	5.8	J	7.0	J	5.2	J	5.8	J
H.MISC	MOISTURE CONTENT	% BY WT.	15		19		13		19	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	12000		16000		9300		15000	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-3 4-6' DATE COLLECTED 18 OCT 93 AMOUNT	Q	WB-3 6-8' 18 OCT 93 AMOUNT	Q	WB-3 10-12' 18 OCT 93 AMOUNT	Q
A.VOA	BENZENE	UG/KG	5.9	U	34		6.9	U
	TOLUENE	UG/KG	5.9	U	6.0	J	6.9	U
	CHLOROBENZENE	UG/KG	12		34		6.9	U
TOTAL CONCENTRATIONS: VOA			12		74.0			
E.METALS	ARSENIC	MG/KG	3.6		19		6.5	
	BARIUM	MG/KG	49		72		40	
	BERYLLIUM	MG/KG	0.59	U	0.91		0.70	U
	CADMIUM	MG/KG	1.3		2.8		1.3	
	CHROMIUM	MG/KG	22		85		32	
	COPPER	MG/KG	12	U	63		14	U
	IRON	MG/KG	17000		30000		18000	
	LEAD	MG/KG	37		160		25	
	MANGANESE	MG/KG	310		790		850	
	MERCURY	MG/KG	0.59		18		39	
	NICKEL	MG/KG	11		30		15	
	SODIUM	MG/KG	3800		18000		11000	
	ZINC	MG/KG	66		310		66	
H.MISC	MOISTURE CONTENT	% BY WT.	15		45		28	
	PH	PH UNITS	10	J	9.9	J	9.7	J
	TOTAL ORGANIC CARBON (TOC)	MG/KG	3600		29000		13000	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3 .
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-4 0-2' DATE COLLECTED 18 OCT 93 AMOUNT	Q	WB-4 4-6' 18 OCT 93 AMOUNT	Q	WB-4 6-8' 18 OCT 93 AMOUNT	Q
A.VOA	BENZENE	UG/KG	5.7	U	5.6	U	2.6	J
	CHLOROBENZENE	UG/KG	5.7	U	5.6	U	5.2	J
	TOTAL CONCENTRATIONS: VOA						7.8	
B.SVOA	1,4-DICHLOROBENZENE	UG/KG	160	J	370	U	420	U
	1,2-DICHLOROBENZENE	UG/KG	250	J	370	U	420	U
	1,2,4-TRICHLOROBENZENE	UG/KG	270	J	370	U	420	U
	BUTYL BENZYL PHTHALATE	UG/KG	920	J	370	UJ	420	UJ
	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	200	J	370	U	420	U
	TOTAL CONCENTRATIONS: SVOA		1800					
E.METALS	ARSENIC	MG/KG	3.6		4.4		3.2	
	BARIUM	MG/KG	520		32		25	U
	BERYLLIUM	MG/KG	0.60		0.56	U	0.63	U
	CADMIUM	MG/KG	1.2		0.95		1.0	
	CHROMIUM	MG/KG	23		7.9		17	
	COPPER	MG/KG	14		11	U	13	U
	IRON	MG/KG	15000		10000		10000	
	LEAD	MG/KG	42		18		29	
	MANGANESE	MG/KG	460		110		600	
	MERCURY	MG/KG	9.0		0.30		0.96	
	NICKEL	MG/KG	13		6.0		9.0	
	SODIUM	MG/KG	850		2900		7700	
	ZINC	MG/KG	68		28		82	
H.MISC	MOISTURE CONTENT	% BY WT.	12		11		21	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
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- - : NOT ANALYZED

TABLE 3-7
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID					
			WB-4 0-2'		WB-4 4-6'		WB-4 6-8'	
			DATE COLLECTED					
			18 OCT 93		18 OCT 93		18 OCT 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q
H.MISC	PH	PH UNITS	7.8	J	10	J	10	J
	TOTAL ORGANIC CARBON (TOC)	MG/KG	3500		1800		4100	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
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TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID: WB-5 4-6' DATE COLLECTED: 18 OCT 93 AMOUNT	Q	WB-5 6-8' 18 OCT 93 AMOUNT	Q	WB-5 10-12' 18 OCT 93 AMOUNT	Q	WB-5 15-17' 18 OCT 93 AMOUNT	Q
A.VOA	TRICHLOROFLUOROMETHANE	UG/KG	45	U	8.3	U	11.1		7	U
TOTAL CONCENTRATIONS: VOA							11.1			
E.METALS	ARSENIC	MG/KG	2.3		13		5.5		8.5	
	BARIUM	MG/KG	71		64		71		38	
	BERYLLIUM	MG/KG	0.97		0.91		0.93	U	0.71	U
	CADMIUM	MG/KG	3.0		2.2		1.4		1.2	
	CHROMIUM	MG/KG	86		70		41		29	
	COPPER	MG/KG	69		49		19	U	14	U
	IRON	MG/KG	29000		28000		29000		18000	
	LEAD	MG/KG	160		120		22		21	
	MANGANESE	MG/KG	1200		830		200		400	
	MERCURY	MG/KG	0.96		0.88		0.46	U	3.2	
	NICKEL	MG/KG	30		28		23		15	
	SODIUM	MG/KG	7000		7400		1800		3800	
	ZINC	MG/KG	370		280		59		64	
H.MISC	MOISTURE CONTENT	% BY WT.	45		40		46		29	
	PH	PH UNITS	7.2	J	6.7	J	3.9	J	6.5	J
	TOTAL ORGANIC CARBON (TOC)	MG/KG	31000		21000		80000		14000	

QUALIFIERS:
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- - : NOT ANALYZED

TABLE 3-7
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID		WB-6 4-6'		WB-6 6-8'	
			DATE COLLECTED		19 OCT 93		19 OCT 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q
A.VOA	BENZENE	UG/KG	51000		17000		26000	
	CHLOROBENZENE	UG/KG	290000		78000		84000	
	TOTAL CONCENTRATIONS: VOA		341000		95000		110000	
B.SVOA	PHENOL	UG/KG	380	U	620	J	11000	U
	1,3-DICHLOROBENZENE	UG/KG	620		950	J	8800	J
	1,4-DICHLOROBENZENE	UG/KG	3900		16000		140000	
	1,2-DICHLOROBENZENE	UG/KG	3800		18000		140000	
	1,2,4-TRICHLOROBENZENE	UG/KG	1900		6900		100000	
	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	200	J	1200	U	11000	U
	TOTAL CONCENTRATIONS: SVOA		10420		42470		388800	
E.METALS	ARSENIC	MG/KG	3.6		13		12	
	BARIUM	MG/KG	220		250		620	
	BERYLLIUM	MG/KG	0.58	U	1.3		1.1	
	CHROMIUM	MG/KG	21		68		71	
	IRON	MG/KG	13000		26000		26000	
	LEAD	MG/KG	26		110		96	
	MANGANESE	MG/KG	280		1100		1100	
	MERCURY	MG/KG	22		23		130	
	NICKEL	MG/KG	12		27		28	
	SODIUM	MG/KG	2300		11000		9900	
	ZINC	MG/KG	63	J	220	J	220	J
H.MISC	MOISTURE CONTENT	% BY WT.	14		44		39	
	PH	PH UNITS	8.1	J	9.5	J	9.6	J

QUALIFIERS:
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TABLE 3-7
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID					
			WB-6 2-4'		WB-6 4-6'		WB-6 6-8'	
			DATE COLLECTED					
			19 OCT 93		19 OCT 93		19 OCT 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q
H.MISC	PHENOLICS, TOTAL	MG/KG	30	U	35		2.0	
	TOTAL ORGANIC CARBON (TOC)	MG/KG	4500		22000		14000	

QUALIFIERS:
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TABLE 3 .
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-7 2-4' DATE COLLECTED 19 OCT 93 AMOUNT	Q	WB-7 4-6' 19 OCT 93 AMOUNT	Q	WB-7 6-8' 19 OCT 93 AMOUNT	Q
A.VOA	CHLOROBENZENE	UG/KG	18		8.8		20	
	TOTAL CONCENTRATIONS: VOA		18		8.8		20	
B.SVOA	1,3-DICHLOROBENZENE	UG/KG	420	U	420	U	480	
	1,4-DICHLOROBENZENE	UG/KG	420	U	420	U	3500	
	1,2-DICHLOROBENZENE	UG/KG	420	U	420	U	1800	
	1,2,4-TRICHLOROBENZENE	UG/KG	420	U	420	U	570	
	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	420	U	420	U	170	J
	TOTAL CONCENTRATIONS: SVOA						6520	
E.METALS	ANTIMONY	MG/KG	5.7		5.1	U	5.6	U
	ARSENIC	MG/KG	7.5		3.5		6.0	
	BARIUM	MG/KG	53		310		150	
	BERYLLIUM	MG/KG	1.0		0.77		0.94	
	CHROMIUM	MG/KG	40		30		35	
	IRON	MG/KG	23000		15000		17000	
	LEAD	MG/KG	30		37		44	
	MANGANESE	MG/KG	390		410		440	
	MERCURY	MG/KG	5.1		31		100	
	NICKEL	MG/KG	17		13		16	
	SODIUM	MG/KG	3700		2700		2800	
	ZINC	MG/KG	88	J	82	J	96	
H.MISC	MOISTURE CONTENT	% BY WT.	22		22		28	
	PH	PH UNITS	7.9	J	8.4	J	8.5	J
	TOTAL ORGANIC CARBON (TOC)	MG/KG	6700		4000		7600	

QUALIFIERS:
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TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-8 2-4' DATE COLLECTED 19 OCT 93 AMOUNT	Q	WB-8 4-6' 19 OCT 93 AMOUNT	Q	WB-8 8-10' 19 OCT 93 AMOUNT	Q
A.VOA	BENZENE	UG/KG	5.7	U	18		18	U
	CHLOROBENZENE	UG/KG	2.9	J	44		62	
	TOTAL CONCENTRATIONS: VOA		2.9		62		62	
B.SVOA	1,4-DICHLOROBENZENE	UG/KG	120	J	600	U	220	J
	1,2-DICHLOROBENZENE	UG/KG	230	J	600	U	590	U
	1,2,4-TRICHLOROBENZENE	UG/KG	330	J	600	U	590	U
	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	1000		160	J	230	J
	TOTAL CONCENTRATIONS: SVOA		1680		160		450	
E.METALS	ANTIMONY	MG/KG	4.6	U	7.3	U	7.2	
	ARSENIC	MG/KG	5.0		19		25	
	BARIUM	MG/KG	100		130		83	
	BERYLLIUM	MG/KG	0.75		2.1		1.6	
	CHROMIUM	MG/KG	20		110		89	
	IRON	MG/KG	14000		35000		29000	
	LEAD	MG/KG	30		180		160	
	MANGANESE	MG/KG	410		600		460	
	MERCURY	MG/KG	16		270		110	
	NICKEL	MG/KG	9.4		30		25	
	SODIUM	MG/KG	830		6700		5800	
	ZINC	MG/KG	50		260	J	270	J
H.MISC	MOISTURE CONTENT	% BY WT.	13		45		44	
	PH	PH UNITS	8.1	J	7.4	J	7.1	J
	TOTAL ORGANIC CARBON (TOC)	MG/KG	3900		31000		28000	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
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TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-9 2-4' DATE COLLECTED 19 OCT 93 AMOUNT	Q	WB-9 4-6' 19 OCT 93 AMOUNT	Q	WB-9 6-8' 19 OCT 93 AMOUNT	Q	WB-9 8-10' 19 OCT 93 AMOUNT	Q
A.VOA	BENZENE	UG/KG	5.6	U	8.3	U	12		48	U
	CHLOROBENZENE	UG/KG	4.3	J	8.3	U	5.9	J	48	U
	TOTAL CONCENTRATIONS: VOA		4.3				17.9			
B.SVOA	1,2-DICHLOROBENZENE	UG/KG	110	J	550	U	540	U	630	U
	DI-N-BUTYL PHTHALATE	UG/KG	93	J	550	U	140	J	630	U
	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	110	J	550	U	540	U	630	U
	TOTAL CONCENTRATIONS: SVOA		313				140			
E.METALS	ARSENIC	MG/KG	3.1		23		19		29	
	BARIUM	MG/KG	48		59		64		77	
	BERYLLIUM	MG/KG	0.76		1.5		1.7		2.5	
	CHROMIUM	MG/KG	16		70		77		94	
	IRON	MG/KG	14000		25000		24000		35000	
	LEAD	MG/KG	18		120		140		190	
	MANGANESE	MG/KG	320		470		450		1500	
	MERCURY	MG/KG	3.6		33		4.4		1.9	
	NICKEL	MG/KG	8.1		24		26		40	
	SODIUM	MG/KG	440		6100		5800		7900	
	ZINC	MG/KG	30		270	J	240	J	420	J
H.MISC	MOISTURE CONTENT	% BY WT.	10		40		39		48	
	PH	PH UNITS	7.3	J	8.2	J	7.8	J	8.4	J
	TOTAL ORGANIC CARBON (TOC)	MG/KG	2600		25000		22000		37000	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
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- - : NOT ANALYZED

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
SOIL BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID SB-4 2-4' DATE COLLECTED 25 OCT 93 AMOUNT	Q	SB-4 4-6' 25 OCT 93 AMOUNT	Q	SB-4 6-8' 25 OCT 93 AMOUNT	Q	SB-4A 6-8' 05 NOV 93 AMOUNT	Q
A.VOA	METHYLENE CHLORIDE	UG/KG	13	U	12	U	12	U	4.0	J
	CHLOROBENZENE	UG/KG	3.4	J	6.0	U	5.9	U	5.8	U
TOTAL CONCENTRATIONS: VOA			3.4						4.0	
E.METALS	ARSENIC	MG/KG	3.7		2.0		21.1		12.3	J
	BARIUM	MG/KG	20	U	24.2		28.0		24.7	
	BERYLLIUM	MG/KG	0.64		0.50	U	0.50	U	0.50	U
	CHROMIUM	MG/KG	18.0		8.8		10.2		8.9	
	COPPER	MG/KG	5.6		4.2		4.1		5.4	
	IRON	MG/KG	28000		15400		19400		28800	
	LEAD	MG/KG	20.8		12.8		15.6		18.0	
	MANGANESE	MG/KG	283		161		194		395	
	MERCURY	MG/KG	0.69	J	0.43	J	0.27	J	0.12	UJ
	NICKEL	MG/KG	5.5		4.0	U	4.0	U	4.0	U
	SODIUM	MG/KG	910		792		724		635	
	ZINC	MG/KG	24.7		17.1		21.9		16.9	
G.PH	PH	PH UNITS	6.4	J	7.1	J	7.3	J	8.1	J
H.MISC	MOISTURE CONTENT	% BY WT.	-		-		-		13.1	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	2770		1270		2130		506	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
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TABLE 3-
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
SOIL BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID SB-5 4-6' DATE COLLECTED 27 OCT 93 AMOUNT	Q	SB-5 6-8' 27 OCT 93 AMOUNT	Q	SB-5 20-22' 27 OCT 93 AMOUNT	Q
A.VOA	BENZENE	UG/KG	6.1	U	2.6	J	69	
	CHLOROBENZENE	UG/KG	3.6	J	5.9	U	3.4	J
	TRICHLOROFLUOROMETHANE	UG/KG	6.1	U	5.9	U	19.6	
TOTAL CONCENTRATIONS: VOA			3.6		2.6		92.0	
E.METALS	ARSENIC	MG/KG	3.5	J	4.6	J	10.3	J
	BARIUM	MG/KG	40.2		35.4		67.1	
	CHROMIUM	MG/KG	15.5	J	14.7	J	43.5	J
	COPPER	MG/KG	6.2		6.7		8.0	
	IRON	MG/KG	14400	J	15700	J	26500	J
	LEAD	MG/KG	15.2		14.6		22.8	
	MANGANESE	MG/KG	115		142		213	
	MERCURY	MG/KG	0.22	J	0.12	UJ	0.19	J
	NICKEL	MG/KG	7.9		8.6		22.7	
	SODIUM	MG/KG	1330		1130		1340	
	ZINC	MG/KG	24.2	J	25.1	J	58.2	J
G.PH	PH	PH UNITS	6.7	J	7.2	J	4.3	J
H.MISC	MOISTURE CONTENT	% BY WT.	17.4		14.8		40.7	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	4040		1470		48800	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
GROUND WATER
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID A-29 OB DATE COLLECTED 14 DEC 93 AMOUNT	Q	A-29D 14 DEC 93 AMOUNT	Q	A-29S 14 DEC 93 AMOUNT	Q
A.VOA	CHLOROFORM	UG/L	3.3	J	5.0	U	5.0	U
TOTAL CONCENTRATIONS: VOA			3.3					
E.METALS	ARSENIC	UG/L	10	UJ	10.0	J	10	UJ
	BARIUM	UG/L	334		265		226	
	CHROMIUM	UG/L	49.3		62.9		31.7	
	IRON	UG/L	148000		73000		98600	
	MANGANESE	UG/L	32600		1400		153000	
	NICKEL	UG/L	50.9		40	U	94.2	
	SODIUM	UG/L	294000		412000		495000	
E.METALS-DISS	BARIUM -DISS	UG/L	313		271		253	
	CHROMIUM -DISS	UG/L	10	U	10	U	25.4	
	IRON -DISS	UG/L	107000		18500		80200	
	MANGANESE -DISS	UG/L	32300		857		157000	
	NICKEL -DISS	UG/L	40	U	40	U	93.9	
	SODIUM -DISS	UG/L	325000		443000		603000	
	ZINC -DISS	UG/L	74.2		56.9		34.0	
X.MISC	CHLORIDE	MG/L	895		627		1800	
	PHENOLICS, TOTAL	MG/L	0.005	U	0.005	U	0.0060	
	SULFATE	MG/L	132		10.4		71.8	
	TOTAL ORGANIC CARBON (TOC)	MG/L	11.0		24.0		10.0	
	TOTAL SUSPENDED SOLIDS (TSS)	MG/L	1130		1520		26.0	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-7
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 2
GROUND WATER
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID			
			A-30 OB		A-30D	
			DATE COLLECTED			
			13 DEC 93		13 DEC 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q
E.METALS	BARIUM	UG/L	724		1230	
	CHROMIUM	UG/L	11.1		10	U
	COPPER	UG/L	25	U	53.5	
	IRON	UG/L	29300	J	192000	J
	MANGANESE	UG/L	2420		1880	
	SODIUM	UG/L	3290000		353000	
	ZINC	UG/L	124		55.7	
E.METALS-DISS	BARIUM -DISS	UG/L	732		1230	
	IRON -DISS	UG/L	23400		192000	
	MANGANESE -DISS	UG/L	2440		1870	
	SODIUM -DISS	UG/L	3770000		346000	
	ZINC -DISS	UG/L	35.1		95.3	
G.PH	PH	PH UNITS	6.6	J	5.3	J
X.MISC	CHLORIDE	MG/L	6030		1750	
	SULFATE	MG/L	37.8		49.4	
	TOTAL ORGANIC CARBON (TOC)	MG/L	37.0		1.4	
	TOTAL SUSPENDED SOLIDS (TSS)	MG/L	206		53.0	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 3
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-10 4-6' DATE COLLECTED 21 SEP 93 AMOUNT	Q	WB-10 6-8' 21 SEP 93 AMOUNT	Q	WB-10 6-8' TCLP 21 SEP 93 AMOUNT	Q	WB-10 8-10' 21 SEP 93 AMOUNT	Q
A.VOA	VINYL CHLORIDE	UG/KG	1400		2400		-		1000	
	CHLOROETHANE	UG/KG	2000	UJ	2100	J	-		100	UJ
	METHYLENE CHLORIDE	UG/KG	660	J	190	J	-		100	UJ
	1,1-DICHLOROETHANE	UG/KG	1000	U	30	J	-		23	J
	1,2-DICHLOROETHENE, TOTAL	UG/KG	1000	UJ	84		-		51	UJ
	CHLOROFORM	UG/KG	1000	U	45	U	-		35	J
	TRICHLOROETHENE	UG/KG	1000	U	45	U	-		110	
	BENZENE	UG/KG	1000	UJ	33	J	-		70	J
	TETRACHLOROETHENE	UG/KG	1000	U	45	UJ	-		60	J
	TOLUENE	UG/KG	1000	U	45	U	-		23	J
	CHLOROBENZENE	UG/KG	1400		34	J	-		38	J
	TOTAL CONCENTRATIONS: VOA		3460		4871				1359	
B.SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	110000	U	120000	U	-		430000	J
	INDENO(1,2,3-CD)PYRENE	UG/KG	36000	J	120000	UJ	-		67000	UJ
	DIBENZ(A,H)ANTHRACENE	UG/KG	36000	J	120000	UJ	-		67000	UJ
	BENZO(G,H,I)PERYLENE	UG/KG	45000	J	120000	UJ	-		67000	UJ
	TOTAL CONCENTRATIONS: SVOA		117000						430000	
E.METALS	ANTIMONY	MG/KG	6.6	U	7.3	U	-		44	
	CHROMIUM	MG/KG	79		23		-		39	
	COPPER	MG/KG	16	U	18	U	-		36	
	IRON	MG/KG	9300		2200		-		5100	
	LEAD	MG/KG	22		5.0		-		580	
	MANGANESE	MG/KG	320		52		-		45	
	MERCURY	MG/KG	0.42		0.96		-		1400	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-8
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 3
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID		WB-10 6-8'		WB-10 6-8' TCLP		WB-10 8-10'	
			WB-10 4-6'							
			DATE COLLECTED							
			21 SEP 93		21 SEP 93		21 SEP 93		21 SEP 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q
E.METALS	SODIUM	MG/KG	260		440		-		1400	
	ZINC	MG/KG	73		51		-		78	
H.MISC	MOISTURE CONTENT	% BY WT.	39		45		-		51	
	PH	PH UNITS	5.7	J	5.2	J	-		7.6	J
	PHENOLICS, TOTAL	MG/KG	0.410	U	0.454	U	-		5.44	
	TOTAL ORGANIC CARBON (TOC)	MG/KG	8700		7600		-		11000	
O.TCLP METALS	CHROMIUM (TCLP)	MG/L	-		-		0.038		-	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
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NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-_
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 3
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-11 06-08 DATE COLLECTED 22 SEP 93 AMOUNT	Q	WB-11 12-14 22 SEP 93 AMOUNT	Q
A.VOA	VINYL CHLORIDE	UG/KG	1600	U	2900000	
	TOTAL CONCENTRATIONS: VOA				2900000	
E.METALS	ARSENIC	MG/KG	1.6		1.8	UJ
	BARIUM	MG/KG	27		35	U
	CHROMIUM	MG/KG	30		10	
	IRON	MG/KG	8600		730	
	LEAD	MG/KG	28		4.8	
	MANGANESE	MG/KG	150		33	
	MERCURY	MG/KG	6.9		17	
	NICKEL	MG/KG	5.0		9.4	
	SODIUM	MG/KG	240		1000	
	ZINC	MG/KG	57		78	
H.MISC	MOISTURE CONTENT	% BY WT.	25		43	
	PH	PH UNITS	7.6	J	8.1	J
	TOTAL ORGANIC CARBON (TOC)	MG/KG	4200		8800	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
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NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-8
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 3
SOIL BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID SB-8 2-4' DATE COLLECTED 20 OCT 93 AMOUNT	Q	SB-8 8-10' 20 OCT 93 AMOUNT	Q	SB-8 20-22' 20 OCT 93 AMOUNT	Q
E.METALS	ARSENIC	MG/KG	2.6		3.7		6.2	
	BARIUM	MG/KG	74		41		41	
	CADMIUM	MG/KG	0.72		1.2		1.1	
	CHROMIUM	MG/KG	6.9		23		31	
	IRON	MG/KG	16000		22000		15000	
	LEAD	MG/KG	9.3		21		24	
	MANGANESE	MG/KG	440		92		180	
	MERCURY	MG/KG	0.13		0.18		0.15	
	NICKEL	MG/KG	4.0		7.7		14	
	SODIUM	MG/KG	110	U	120	U	470	
	ZINC	MG/KG	14		28		69	
G.PH	PH	PH UNITS	5.2	J	6.5	J	6.1	J
H.MISC	MOISTURE CONTENT	% BY WT.	11		20		27	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	850		1500		15000	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
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- : NOT ANALYZED

TABLE 3-8
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 3
SOIL BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID SB-9 4-6' DATE COLLECTED 20 OCT 93 AMOUNT	Q	SB-9 10-12' 20 OCT 93 AMOUNT	Q	SB-9 15-17' 20 OCT 93 AMOUNT	Q
E.METALS	ARSENIC	MG/KG	3.9		3.8		4.4	
	BARIUM	MG/KG	53		33		54	
	CADMIUM	MG/KG	1.1		0.99		1.5	
	CHROMIUM	MG/KG	21		15		40	
	IRON	MG/KG	19000		16000		23000	
	LEAD	MG/KG	15		15		25	
	MANGANESE	MG/KG	120		130		510	
	NICKEL	MG/KG	9.5		7.5		20	
	SODIUM	MG/KG	260		110	U	290	
	ZINC	MG/KG	32		23		77	
G.PH	PH	PH UNITS	6.4	J	7.5	J	5.8	J
H.MISC	MOISTURE CONTENT	% BY WT.	17		13		31	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	1500		1400		16000	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR WASTE LAKE 3
GROUND WATER
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID A-18 DATE COLLECTED 17 DEC 93 AMOUNT	Q	SAMPLE ID R-112 20 DEC 93 AMOUNT	Q
A.VOA	CHLOROBENZENE	UG/L	5.0	U	15	
	TOTAL CONCENTRATIONS: VOA				15	
B.SVOA	1,4-DICHLOROBENZENE	UG/L	10	U	4.6	J
	1,2-DICHLOROBENZENE	UG/L	10	U	3.5	J
	BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	10	U	22	
	TOTAL CONCENTRATIONS: SVOA				30.1	
E.METALS	IRON	UG/L	279		207	
	MANGANESE	UG/L	99.4		15.6	
	SELENIUM	UG/L	5	U	17.8	
	SODIUM	UG/L	272000	J	332000	J
	ZINC	UG/L	44.3	J	273	J
E.METALS-DISS	SELENIUM -DISS	UG/L	5	UJ	16.5	J
	SODIUM -DISS	UG/L	303000		386000	
	ZINC -DISS	UG/L	27.0		105	
X.MISC	CHLORIDE	MG/L	539		493	
	SULFATE	MG/L	143		402	
	TOTAL ORGANIC CARBON (TOC)	MG/L	1.6		3.4	
	TOTAL SUSPENDED SOLIDS (TSS)	MG/L	12.0		8.0	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-
SUMMARY OF ANALYTICAL RESULTS FOR OLD BRINE SLUDGE LANDFILL
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-12 4-6' DATE COLLECTED 23 SEP 93 AMOUNT	Q	WB-12 8-10' 23 SEP 93 AMOUNT	Q
A.VOA	VINYL CHLORIDE	UG/KG	3200		29000	
	CHLOROFORM	UG/KG	880		890	J
	BENZENE	UG/KG	3800		1500	U
	TETRACHLOROETHENE	UG/KG	1900		800	J
	TOTAL CONCENTRATIONS: VOA		9780		30690	
B.SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	73000	R	990000	J
	TOTAL CONCENTRATIONS: SVOA				990000	
E.METALS	ANTIMONY	MG/KG	10		5.0	U
	ARSENIC	MG/KG	2.4		2.2	
	BARIUM	MG/KG	130	J	78	J
	CADMIUM	MG/KG	0.97		1.4	
	CHROMIUM	MG/KG	4.7		6.7	
	IRON	MG/KG	5200		6000	
	LEAD	MG/KG	47		40	
	MANGANESE	MG/KG	57		70	
	MERCURY	MG/KG	240		440	
	NICKEL	MG/KG	6.7		15	
	SODIUM	MG/KG	3400		12000	
	ZINC	MG/KG	110		110	
H.MISC	MOISTURE CONTENT	% BY WT.	18		19	
	PH	PH UNITS	8.4	J	8.3	J
	PHENOLICS, TOTAL	MG/KG	0.49		0.94	
	TOTAL ORGANIC CARBON (TOC)	MG/KG	10000		12000	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-6
SUMMARY OF ANALYTICAL RESULTS FOR OLD BRINE SLUDGE LANDFILL
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID: WB-13 4-6' DATE COLLECTED: 23 SEP 93 AMOUNT	Q	WB-13 6-8' 23 SEP 93 AMOUNT	Q	WB-13 6-8'(TCLP) 23 SEP 93 AMOUNT	Q	WB-13 10-12' 23 SEP 93 AMOUNT	Q
A.VOA	VINYL CHLORIDE	UG/KG	8800		210000		-		18000	
	CHLOROFORM	UG/KG	840		7600	U	-		760	U
	TETRACHLOROETHENE	UG/KG	500	J	7600	U	-		550	J
	TOTAL CONCENTRATIONS: VOA		10140		210000				18550	
B.SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	110000	J	430000	R	-		930000	J
	TOTAL CONCENTRATIONS: SVOA		110000						930000	
E.METALS	ANTIMONY	MG/KG	23		5.5		-		4.9	U
	ARSENIC	MG/KG	3.8		1.2	U	-		2.9	
	BARIUM	MG/KG	90	J	100	J	-		690	J
	BERYLLIUM	MG/KG	0.62	U	0.61	U	-		0.74	
	CADMIUM	MG/KG	1.3		1.7		-		2.8	
	CHROMIUM	MG/KG	8.2		27		-		19	
	COPPER	MG/KG	37		130	J	-		100	
	IRON	MG/KG	7300		8300		-		13000	
	LEAD	MG/KG	140		170		-		69	
	MANGANESE	MG/KG	100		50		-		230	
	MERCURY	MG/KG	4400		210		-		950	
	NICKEL	MG/KG	11		35		-		21	
	SILVER	MG/KG	1.2	U	1.2	U	-		1.7	
	SODIUM	MG/KG	4100		4400		-		11000	
	ZINC	MG/KG	290		1100		-		620	
H.MISC	MOISTURE CONTENT	% BY WT.	20		18		-		18	
	PH	PH UNITS	8.0	J	7.9	J	-		8.0	J

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-9
SUMMARY OF ANALYTICAL RESULTS FOR OLD BRINE SLUDGE LANDFILL
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID WB-13 4-6' DATE COLLECTED 23 SEP 93 AMOUNT Q	WB-13 6-8' 23 SEP 93 AMOUNT Q	WB-13 6-8'(TCLP) 23 SEP 93 AMOUNT Q	WB-13 10-12' 23 SEP 93 AMOUNT Q
H.MISC	PHENOLICS, TOTAL	MG/KG	0.30 U	0.30 U	-	0.30
	TOTAL ORGANIC CARBON (TOC)	MG/KG	12000	7500	-	8700
M.TCLP VOA	VINYL CHLORIDE (TCLP)	MG/L	-	-	0.27	-
	2-BUTANONE (TCLP)	MG/L	-	-	0.14 J	-
O.TCLP METALS	LEAD (TCLP)	MG/L	-	-	0.457	-

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-9
SUMMARY OF ANALYTICAL RESULTS FOR OLD BRINE SLUDGE LANDFILL
SOIL BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID SB-2 2-4' DATE COLLECTED 01 NOV 93 AMOUNT	Q	SB-2 10-12' 01 NOV 93 AMOUNT	Q	SB-2 17-19' 01 NOV 93 AMOUNT	Q
E.METALS	ARSENIC	MG/KG	24.6		2.3		1.0	U
	BARIUM	MG/KG	50.5		56.4		55.7	
	CADMIUM	MG/KG	0.86		0.50	U	0.50	U
	CHROMIUM	MG/KG	7.5		14.2		12.9	
	COPPER	MG/KG	27.2		5.4		5.8	
	IRON	MG/KG	5500		13100		15500	
	LEAD	MG/KG	31.9		12.5		17.2	
	MANGANESE	MG/KG	58.7		222		1590	
	MERCURY	MG/KG	35.5	J	.095	U	0.10	U
	NICKEL	MG/KG	8.0		8.0		7.6	
	SODIUM	MG/KG	1570		500	U	1160	
	ZINC	MG/KG	373		24.5		28.8	
G.PH	PH	PH UNITS	7.8	J	6.7	J	6.5	J
H.MISC	MOISTURE CONTENT	% BY WT.	29.4		11.6		12.8	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	6420		2940		3910	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR OLD BRINE SLUDGE LANDFILL
GROUND WATER
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID: A-26 OB, DATE COLLECTED: 17 DEC 93 AMOUNT	Q	A-26D, 17 DEC 93 AMOUNT	Q	A-26S, 17 DEC 93 AMOUNT	Q	B-05, 17 DEC 93 AMOUNT	Q
B.SVOA	DIETHYL PHTHALATE	UG/L	-		-		-		2.3	J
	TOTAL CONCENTRATIONS: SVOA								2.3	
E.METALS	BARIUM	UG/L	215		200	U	200	U	200	U
	IRON	UG/L	33000		514		1830		13200	
	LEAD	UG/L	3.0	UJ	5.1	J	3.0	UJ	7.0	
	MANGANESE	UG/L	7110		190		2660		7880	
	MERCURY	UG/L	0.2	U	0.24		0.2	U	0.50	
	NICKEL	UG/L	40	U	40	U	40	U	53.5	
	SODIUM	UG/L	793000	J	276000	J	98400	J	47300	J
	ZINC	UG/L	20	U	82.7		60.9		64.8	
E.METALS-DISS	BARIUM -DISS	UG/L	230		200	U	200	U	200	U
	IRON -DISS	UG/L	27800		100	U	307		100	U
	MANGANESE -DISS	UG/L	7280		15	U	2620		7080	
	NICKEL -DISS	UG/L	40	U	40	U	40	U	51.1	
	SODIUM -DISS	UG/L	979000		312000		119000		60300	
	ZINC -DISS	UG/L	41.5		20	U	43.0		68.9	
X.MISC	CHLORIDE	MG/L	1620		429		222		49.3	
	PHENOLICS, TOTAL	MG/L	0.0077		0.029		0.005	U	0.005	U
	SULFATE	MG/L	301		465		91.4		204	
	TOTAL ORGANIC CARBON (TOC)	MG/L	15.0	J	6.4	J	2.9	J	5.2	J
	TOTAL SUSPENDED SOLIDS (TSS)	MG/L	232		56.0		9.0		35.0	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-
SUMMARY OF ANALYTICAL RESULTS FOR NEW BRINE SLUDGE LANDFILL
GROUND WATER
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID A-6A DATE COLLECTED 15 DEC 93 AMOUNT	Q	A-7A 15 DEC 93 AMOUNT	Q	A-08 16 DEC 93 AMOUNT	Q	A-11A 17 DEC 93 AMOUNT	Q
B.SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	UG/L	10	U	10	U	4.6	J	-	
	TOTAL CONCENTRATIONS: SVOA						4.6			
E.METALS	CHROMIUM	UG/L	11.7		10.7		10	U	10	U
	COPPER	UG/L	31.2		25	U	25	U	25	U
	IRON	UG/L	25400	J	27900	J	1360		505	
	LEAD	UG/L	9.7		3.0	UJ	3.9		3.0	U
	MANGANESE	UG/L	1080		1270		1520		8770	
	MERCURY	UG/L	0.24		0.76		0.37		0.2	U
	SODIUM	UG/L	39400		97900		65000		158000	J
	ZINC	UG/L	102		73.5		482		76.8	
E.METALS-DISS	MANGANESE -DISS	UG/L	25.4		1210		515		9540	
	MERCURY -DISS	UG/L	0.2	U	0.2	U	0.24		0.2	U
	SODIUM -DISS	UG/L	42500		94800		69200		188000	
	ZINC -DISS	UG/L	129		130		272		123	
X.MISC	CHLORIDE	MG/L	93.9		234		145		367	
	SULFATE	MG/L	32.8		109		247		312	
	TOTAL ORGANIC CARBON (TOC)	MG/L	1.2		2.4		2.3		12.0	J
	TOTAL SUSPENDED SOLIDS (TSS)	MG/L	775		313		50.0		7.0	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-10
SUMMARY OF ANALYTICAL RESULTS FOR NEW BRINE SLUDGE LANDFILL
GROUND WATER
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID A-12 DATE COLLECTED 15 DEC 93 AMOUNT	Q	A-13 15 DEC 93 AMOUNT	Q	A-14 16 DEC 93 AMOUNT	Q	A-15 16 DEC 93 AMOUNT	Q
E.METALS	ARSENIC	UG/L	10	U	10	UJ	10	UJ	10	UJ
	IRON	UG/L	34000	J	362		3440		100	U
	MANGANESE	UG/L	4220		15	U	43.9		80.8	
	MERCURY	UG/L	0.2	U	0.2	U	0.2	U	4.8	
	SELENIUM	UG/L	5	UJ	6.2	J	5	UJ	14.5	
	SODIUM	UG/L	49200		479000	J	111000		118000	
	ZINC	UG/L	47.5		98.3		131		59.1	
E.METALS-DISS	IRON -DISS	UG/L	14600	J	100	U	100	U	100	U
	MANGANESE -DISS	UG/L	4000		15	U	21.1		75.9	
	MERCURY -DISS	UG/L	0.2	U	0.2	U	0.2	U	2.3	
	SELENIUM -DISS	UG/L	5	UJ	5	UJ	5	UJ	13.4	
	SODIUM -DISS	UG/L	57900		546000	J	127000		124000	
	ZINC -DISS	UG/L	82.5		68.4		90.8		147	
X.MISC	CHLORIDE	MG/L	44.4		984		170		165	
	SULFATE	MG/L	177		350		96.0		181	
	TOTAL ORGANIC CARBON (TOC)	MG/L	15.0		6.8		6.9		1.0	
	TOTAL SUSPENDED SOLIDS (TSS)	MG/L	44.0		7.0		29.0		5.0	U

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE.
FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-10
SUMMARY OF ANALYTICAL RESULTS FOR NEW BRINE SLUDGE LANDFILL
GROUND WATER
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID A-16 DATE COLLECTED 16 DEC 93 AMOUNT	Q	A-23 16 DEC 93 AMOUNT	Q	A-24 16 DEC 93 AMOUNT	Q
E.METALS	BARIUM	UG/L	200	U	200	U	318	
	COPPER	UG/L	25	U	25	U	30.2	
	IRON	UG/L	195		100	U	31100	
	LEAD	UG/L	3.0	U	3.0	U	11.5	J
	MANGANESE	UG/L	74.2		11500		5840	
	MERCURY	UG/L	0.2	U	0.2	U	4.5	
	SELENIUM	UG/L	5	UJ	5	U	17.2	
	SODIUM	UG/L	239000		68800		248000	
	ZINC	UG/L	129		20.1		230	
E.METALS-DISS	BARIUM -DISS	UG/L	200	U	200	U	221	
	IRON -DISS	UG/L	100	U	100	U	19300	
	MANGANESE -DISS	UG/L	75.1		10200		4750	
	MERCURY -DISS	UG/L	0.2	U	0.2	U	4.7	
	SODIUM -DISS	UG/L	259000		72700		295000	
	ZINC -DISS	UG/L	52.7		40.3		20	U
X.MISC	CHLORIDE	MG/L	425		186		532	
	SULFATE	MG/L	224		51.7		140	
	TOTAL ORGANIC CARBON (TOC)	MG/L	1.0	U	2.0		5.5	
	TOTAL SUSPENDED SOLIDS (TSS)	MG/L	5.0	U	5.0	U	269	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3 ..
SUMMARY OF ANALYTICAL RESULTS FOR CHEMFIX TEST UNIT
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID: WB-14 2-4' DATE COLLECTED: 22 SEP 93 AMOUNT	Q	WB-14 2-4' TCLP 22 SEP 93 AMOUNT	Q	WB-14A 2-4' 22 SEP 93 AMOUNT	Q
A.VOA	VINYL CHLORIDE	UG/KG	220		-		23	
	CHLOROFORM	UG/KG	18	J	-		11	
	TRICHLOROETHENE	UG/KG	12	J	-			7.0 U
	BENZENE	UG/KG		21 U	-		5.1	J
	TETRACHLOROETHENE	UG/KG	90		-		11	J
	ETHYLBENZENE	UG/KG	30		-			7.0 UJ
TOTAL CONCENTRATIONS: VOA			370				50.1	
B.SVOA	BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG		2800 UJ	-		740	J
TOTAL CONCENTRATIONS: SVOA							740	
E.METALS	ARSENIC	MG/KG	2.5		-			1.4 U
	CHROMIUM	MG/KG	6.2		-		18	
	IRON	MG/KG	5200		-		1500	
	LEAD	MG/KG	24		-		7.2	
	MANGANESE	MG/KG	63		-		24	
	MERCURY	MG/KG	80		-		0.66	
	NICKEL	MG/KG	5.9		-			3.5 U
	SODIUM	MG/KG	3700		-		430	
	ZINC	MG/KG	57		-		74	
H.MISC	MOISTURE CONTENT	% BY WT.	52		-		29	
	PH	PH UNITS	11	J	-		8.1	J
	TOTAL ORGANIC CARBON (TOC)	MG/KG	13000		-		8000	
M.TCLP VOA	BENZENE (TCLP)	MG/L		-	0.030			-

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-11
SUMMARY OF ANALYTICAL RESULTS FOR CHEMFIX TEST UNIT
WASTE BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID					
			WB-14 2-4'		WB-14 2-4' TCLP		WB-14A 2-4'	
			DATE COLLECTED					
			22 SEP 93		22 SEP 93		22 SEP 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q
O.TCLP METALS	BARIUM (TCLP)	MG/L	-		0.224		-	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
R : THE RESULT FOR THIS ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
UR : THE QUANTITATIVE LIMIT FOR THE ANALYTE SHOULD BE CONSIDERED UNUSABLE. QUALITY CONTROL CRITERIA WERE NOT MET.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3
SUMMARY OF ANALYTICAL RESULTS FOR CHEMFIX TEST UNIT
SOIL BORING
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

GROUP	PARAMETER NAME	UNITS	SAMPLE ID SB-3 4-6' DATE COLLECTED 21 OCT 93 AMOUNT	Q	SB-3 8-10' 21 OCT 93 AMOUNT	Q	SB-3 10-12' 21 OCT 93 AMOUNT	Q	SB-3 15-17' 21 OCT 93 AMOUNT	Q
A.VOA	VINYL CHLORIDE	UG/KG	11	U	940		39		11	U
	CHLOROFORM	UG/KG	5.7	U	17	J	5.4	U	5.4	U
	1,2-DICHLOROETHANE	UG/KG	9.8		470		11		5.4	U
	BENZENE	UG/KG	4.6	J	35		2.8	J	5.4	U
	TETRACHLOROETHENE	UG/KG	5.7	U	13	J	5.4	U	5.4	U
	CHLOROBENZENE	UG/KG	5.4	J	37		3.3	J	5.4	U
	1,2-DICHLOROETHENE, TOTAL	UG/KG	5.7	U	13	J	5.4	U	5.4	U
TOTAL CONCENTRATIONS: VOA			19.8		1525		56.1			
E.METALS	ARSENIC	MG/KG	2.9		1.2	U	3.2		4.5	
	BARIUM	MG/KG	81		51		22	U	21	U
	BERYLLIUM	MG/KG	0.58		0.64		0.54	U	0.77	
	CADMIUM	MG/KG	0.96		1.2		0.81		0.54	U
	CHROMIUM	MG/KG	19		16		8.5		4.9	
	COPPER	MG/KG	14		12	U	11	U	11	U
	IRON	MG/KG	14000		21000		13000		13000	
	LEAD	MG/KG	20		22		11		9.2	
	MANGANESE	MG/KG	310		1600		460		320	
	MERCURY	MG/KG	0.74		0.11	U	0.11	U	0.11	U
	NICKEL	MG/KG	11		17		4.4		3.9	
	SODIUM	MG/KG	530		700		510		550	
	ZINC	MG/KG	88		41		15		13	
G.PH	PH	PH UNITS	8.2	J	8.0	J	5.1	J	5.5	J
H.MISC	MOISTURE CONTENT	% BY WT.	13		14		7.7		6.9	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	4600		1300		300		300	

QUALIFIERS:
J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- : NOT ANALYZED

TABLE 3-
SUMMARY OF ANALYTICAL RESULTS FOR CHEMFIX TEST UNIT
GROUND WATER
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID A-27D DATE COLLECTED 15 DEC 93		SAMPLE ID A-27S 15 DEC 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q
A.VOA	VINYL CHLORIDE	UG/L	59		150	
	CHLOROFORM	UG/L	14		10	
	CARBON TETRACHLORIDE	UG/L	36		180	
	TETRACHLOROETHENE	UG/L	4.0	J	3.6	J
TOTAL CONCENTRATIONS: VOA			113		343.6	
E.METALS	ARSENIC	UG/L	10	UJ	17.9	J
	CHROMIUM	UG/L	10	U	23.5	
	IRON	UG/L	465		5430	J
	MANGANESE	UG/L	30.7		320	
	MERCURY	UG/L	0.31		7.6	
	SODIUM	UG/L	477000	J	429000	J
	ZINC	UG/L	43.1		23.2	
E.METALS-DISS	ARSENIC -DISS	UG/L	10	U	14.8	
	CHROMIUM -DISS	UG/L	10	U	21.7	
	MANGANESE -DISS	UG/L	19.6		95.8	
	MERCURY -DISS	UG/L	0.2	U	8.7	
	SODIUM -DISS	UG/L	491000	J	511000	J
	ZINC -DISS	UG/L	20	U	49.6	
X.MISC	CHLORIDE	MG/L	931		734	
	SULFATE	MG/L	121		142	
	TOTAL ORGANIC CARBON (TOC)	MG/L	2.1		2.3	
	TOTAL SUSPENDED SOLIDS (TSS)	MG/L	18.0		90.0	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

TABLE 3-12
SUMMARY OF ANALYTICAL RESULTS FOR FORMER DRAIN POND SOUTH OF WASTE LAKE 1
SURFACE SOIL
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/31/94

			SAMPLE ID					
			SS-1		SS-2		SS-3	
			DATE COLLECTED					
			13 SEP 93		13 SEP 93		13 SEP 93	
GROUP	PARAMETER NAME	UNITS	AMOUNT	Q	AMOUNT	Q	AMOUNT	Q
E.METALS	ARSENIC	MG/KG	2.7		2.9		2.8	
	BARIUM	MG/KG	48		32		99	
	BERYLLIUM	MG/KG	0.58	U	0.56		0.89	
	CHROMIUM	MG/KG	10		11		31	
	IRON	MG/KG	6600		9600		17000	
	LEAD	MG/KG	9.5		14		35	
	MANGANESE	MG/KG	230	J	75	J	540	J
	MERCURY	MG/KG	3.3		1.1		1.6	
	NICKEL	MG/KG	5.9		6.4		18	
	SODIUM	MG/KG	95		42		280	J
	ZINC	MG/KG	29	J	24	J	170	J
G.PH	PH	PH UNITS	7.1	J	4.9	J	8.8	J
H.MISC	MOISTURE CONTENT	% BY WT.	14		8.8		16	
X.MISC	TOTAL ORGANIC CARBON (TOC)	MG/KG	8400		7700		7600	

QUALIFIERS:
- J : THIS RESULT SHOULD BE CONSIDERED A QUANTITATIVE ESTIMATE
- B : THIS RESULT IS QUALITATIVELY INVALID BECAUSE THE COMPOUND/ANALYTE WAS ALSO DETECTED IN A BLANK AT A SIMILAR CONCENTRATION.
- U : THIS ANALYTE WAS NOT DETECTED. THE NUMERIC VALUE REPRESENTS THE SAMPLE QUANTITATION/DETECTION LIMIT FOR THE ANALYTE. FOR TICS, BLANK SPACES INDICATE THE ANALYTE WAS NOT DETECTED.
- NA U : THIS ANALYTE WAS NOT DETECTED. NO NUMERIC VALUE IS PROVIDED FOR THE QUANTITATION/DETECTION LIMIT.
- - : NOT ANALYZED

Table 3-13 ***Population of Delaware City (Distribution by Age)***
Occidental Chemical Corporation

Age Group (years)	Total Number of People
Under 5	111
5 to 14	248
15 to 24	250
25 to 34	264
35 to 44	288
45 to 54	185
55 to 64	139
65 to 74	100
75 to 84	76
85 and over	21

Summary	
Median Age	33.7
Total Males	807
Total Females	875

Source: US Department of Commerce, Bureau of Census.
1990 Census of Population, General Population Characteristics.

Table 3-14 ***Summary of Background Inorganic Constituent Concentrations in Soil***
Occidental Chemical Corporation

Constituent	Minimum mg/kg	Maximum mg/kg	SS-4 mg/kg	SS-5 mg/kg	SB-6 2'-4' mg/kg	SB-6 8'-10' mg/kg	SB-6 15'-17' mg/kg
Arsenic	ND	4.1	4.1	3.5	1.8	ND	ND
Barium	22.1	60	60	48	28.5	45.3	22.1
Beryllium	ND	0.89	0.89	0.81	ND	ND	ND
Chromium	4.3	36.4	18	17	36.4	17.8	4.3
Copper	ND	12	ND	12	5	5.9	ND
Iron	2720	145000	14000	14000	145000	12500	2720
Mercury	ND	1.8	1.1	1.8	0.23	ND	ND
Manganese	91	390	390	240	113	91	211
Nickel	ND	17	16	17	6.2	5.9	ND
Lead	3	37	37	26	12	9.4	3
Zinc	10.2	55	55	42	17.7	15.1	10.2

Table 3-15 *Direct Screening Levels for Soil and Water*
Occidental Chemical Corporation

Constituent	Soil Direct Screening Level (units as noted)	Ground Water Direct Screening Level (µg/L)	Ground Water MCL (µg/L)
Volatile Organics	µg/kg		
Benzene	22000	see MCL	5
Bromodichloromethane †	10000	see MCL	100
Carbon tetrachloride	4900	see MCL	5
Chlorobenzene	16000000	39	NA
Chloroethane	16000000	710	NA
Chloroform †	100000	see MCL	100
2-Chloroethyl vinyl ether	2000000	150	NA
1,1-Dichloroethane	7800000	810	NA
1,2-Dichloroethane	7000	see MCL	5
1,2-Dichloroethene (total) *	700000	see MCL	70
Ethylbenzene	7800000	see MCL	700
Methylene chloride	85000	see MCL	5
Tetrachloroethene	12000	see MCL	5
Toluene	16000000	see MCL	1000
1,1,1-Trichloroethane	7000000	see MCL	200
Trichloroethene	58000	see MCL	5
Trichloroflouromethane	23000	1500	NA
Vinyl chloride	340	see MCL	2
Semivolatile Organics	µg/kg		
Benzo(g,h,i)perylene ***	3100000	1500	NA
Bis(2-chloroethyl)ether	580	0.0092	NA
Bis(2-chloroisopropyl)ether	9100	0.26	NA
Bis(2-ethylhexyl)phthalate	46000	see MCL	6
Butylbenzyl phthalate	16000000	see MCL	200
Dibenz(a,h)anthracene	88	see MCL	0.3
Di-n-Butylphthalate	7800000	3700	NA
1,2-Dichlorobenzene	7000000	see MCL	600
1,3-Dichlorobenzene	7000000	see MCL	600
1,4-Dichlorobenzene	27000	see MCL	75
Diethylphthalate	63000000	29000	NA
1,2-Diphenylhydrazine	800	0.084	NA
Hexachlorobenzene	400	see MCL	1
Indeno(1,2,3-c,d)pyrene	880	see MCL	0.4
Phenol	47000000	22000	NA
1,2,4-Trichlorobenzene	780000	see MCL	70
Inorganics	mg/kg		
Antimony	31	see MCL	6
Arsenic	0.37 **	see MCL	50
Barium	5500	see MCL	2000
Beryllium	0.15	see MCL	4
Cadmium	39	see MCL	5
Chromium	390 †††	see MCL	100
Copper ††	2900	see MCL	1300
Iron	NA	NA	NA
Lead ††	500 Δ	see MCL	15
Manganese	390	180	NA
Mercury	23	see MCL	2
Nickel	1600	see MCL	100
Selenium	390	see MCL	50
Silver	390	180	NA
Sodium	NA	NA	NA
Zinc	23464	10950	NA

Notes:

1. Direct Screening Levels are based on current toxicity indices and standard residential exposure assumptions.
2. MCL = Maximum Contaminant Level

NA = Not Available

* = Reported MCL is for the cis isomer.

† = Reported MCL is for total trihalomethanes.

** = Soil DSL is for arsenic as a carcinogen.

†† = Value shown in MCL column represents the action level at the tap.

††† = Soil DSL is for hexavalent chromium.

*** = Soil and ground water DSLs are conservatively based on naphthalene.

Δ = OSWER Directive 9355.4-02

Table 3-16 ***Leaching Screening Levels for Soil***
Occidental Chemical Corporation

Constituent	Ground Water Screening Level (mg/L)	Koc (ml/g)		Kd (ml/g)		Soil Leaching Screening Level (mg/kg)	Soil Leaching Screening Level (µg/kg)
Volatile Organics							
Benzene	0.005	83	1	1.66	3	0.0083	8.3
Chlorobenzene	0.039	330	1	6.6	3	0.2574	257.4
Chloroethane	0.71	3.24	2	0.0648	3	0.046008	46.008
Chloroform	0.1	31	1	0.62	3	0.062	62
2-Chloroethyl vinyl ether	0.15	6.6	2	0.132	3	0.0198	19.8
1,1-Dichloroethane	0.81	30	1	0.6	3	0.486	486
1,2-Dichloroethane	0.005	14	1	0.28	3	0.0014	1.4
1,2-Dichloroethene (total)	0.07	49	1a	0.98	3	0.0686	68.6
Ethylbenzene	0.7	1100	1	22	3	15.4	15400
Methylene Chloride	0.005	8.8	1	0.176	3	0.00088	0.88
Tetrachloroethene	0.005	364	1	7.28	3	0.0364	36.4
Toluene	1	300	1	6	3	6	6000
Trichloroethene	0.005	126	1	2.52	3	0.0126	12.6
Trichloroflouromethane	1.3	159	1	3.18	3	4.134	4134
Vinyl Chloride	0.002	57	1	1.14	3	0.00228	2.28
Semivolatile Organics							
Benzo(g,h,i)perylene *	1.5	1600000	1	32000	3	48000	4800000
Bis(2-ethylhexyl)phthalate	0.006	100000	2	2000	3	12	12000
Butylbenzyl phthalate	0.2	67.6	2	1.352	3	0.2704	270.4
Dibenz(a,h)anthracene	0.0003	3300000	1	66000	3	19.8	19800
Di-N-Butylphthalate	3.7	170000	1	3400	3	12580	12580000
1,2-Dichlorobenzene	0.6	1700	1	34	3	20.4	20400
1,3-Dichlorobenzene	0.6	1700	1	34	3	20.4	20400
1,4-Dichlorobenzene	0.075	1700	1	34	3	2.55	2550
1,2-Diphenylhydrazine	0.000084	418	1	8.36	3	0.00070224	0.70224
Hexachlorobenzene	0.001	39000	1	780	3	0.78	780
Indeno(1,2,3-c,d)pyrene	0.0004	1600000	1	32000	3	12.8	12800
Phenol	22	14.2	1	0.284	3	6.248	6248
1,2,4-Trichlorobenzene	0.07	9200	1	184	3	12.88	12880
Inorganics							
Antimony	0.006	-		45	4	0.27	270
Arsenic	0.05	-		200	4	10	10000
Barium	2	-		60	4	120	120000
Beryllium	0.004	-		650	4	2.6	2600
Cadmium	0.005	-		6.5	4	0.0325	32.5
Chromium	0.1	-		850	4	85	85000
Copper	1.3	-		35	4	45.5	45500
Iron	NA	-		25	4	NA	NA
Lead	0.015	-		900	4	13.5	13500
Manganese	0.18	-		65	4	11.7	11700
Mercury	0.002	-		10	4	0.02	20
Nickel	0.1	-		150	4	15	15000
Silver	0.18	-		45	4	8.1	8100
Sodium	NA	-		100	4	NA	NA
Zinc	10.95	-		40	4	438	438000

Notes/Sources:
NA = Not Available
1 = USEPA,1986 (SPHEM)
1a = Ground water DSL is for the cis isomer.
2 = Montgomery,1990
3 = (kd=koc*foc) where foc is the fraction of organic carbon (assumed to be 2%)
4 = Baes, 1984
* = The DSL shown is conservatively based on naphthalene.

Table 3-17 ***Human Health Constituents of Potential Concern in Soils***
Occidental Chemical Corporation

SWMU	Inorganic Constituents			Organic Constituents	
	>Background	>DSL	>LSL	>DSL	>LSL
WL-1 (Waste Lake No. 1)	Arsenic Barium Cadmium Chromium Copper Mercury Silver Nickel Lead Zinc	Arsenic Barium Chromium Mercury Sodium *	Barium Cadmium Chromium Copper Mercury Silver Nickel Lead Sodium * Zinc	Benzene 1,4-Dichlorobenzene Hexachlorobenzene 1,2,4-Trichlorobenzene Vinyl Chloride	Benzene Chlorobenzene 2-Chloroethylvinyl ether 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichloroethene (total) 1,2-Diphenylhydrazine Hexachlorobenzene 1,2,4-Trichlorobenzene Trichloroethene Vinyl Chloride
WL-2 (Waste Lake No. 2)	Antimony Arsenic Barium Beryllium Cadmium Chromium Copper Mercury Manganese Nickel Lead Zinc	Arsenic Beryllium Managanese Mercury Sodium *	Antimony Arsenic Barium Cadmium Chromium Copper Mercury Manganese Nickel Lead Sodium *	Benzene 1,4-Dichlorobenzene	Benzene Butylbenzyl phthalate Chlorobenzene 1,2-Dichlorobenzene 1,4-Dichlorobenzene Methylene Chloride 1,2,4-Trichlorobenzene
WL-3 (Waste Lake No. 3)	Antimony Arsenic Barium Cadmium Chromium Copper Manganese Mercury Nickel Lead Zinc	Antimony Arsenic Lead Manganese Mercury Sodium *	Antimony Cadmium Manganese Mercury Nickel Lead Sodium *	Bis(2-ethylhexyl)phthalate Dibenz(a,h)anthracene Indeno(1,2,3-c,d)pyrene VinylChloride	Benzene Bis(2-ethylhexyl)phthalate Chlorobenzene Chloroethane Dibenz(a,h)anthracene 1,2-Dichloroethene (total) Indeno(1,2,3-c,d)pyrene Methylene Chloride Tetrachloroethene Trichloroethene VinylChloride
OBSL (Old Brine Sludge Landfill)	Antimony Arsenic Barium Cadmium Copper Manganese Mercury Silver Nickel Lead Zinc	Arsenic Manganese Mercury Sodium *	Antimony Arsenic Barium Cadmium Copper Manganese Mercury Nickel Lead Zinc Sodium *	Bis(2-ethylhexyl)phthalate Vinyl Chloride	Benzene Bis(2-ethylhexyl)phthalate Chloroform Tetrachloroethene Vinyl Chloride
Storm Drainage Pond South of WL-1	Barium Mercury Manganese Nickel Zinc	Manganese Sodium *	Mercury Manganese Nickel Sodium *	None	None
Chemfix Test Unit	Arsenic Barium Cadmium Copper Mercury Manganese Zinc	Arsenic Manganese Mercury Sodium *	Cadmium Mercury Manganese Sodium *	Vinyl Chloride	Benzene 1,2-Dichloroethane Tetrachloroethene Vinyl Chloride

Notes:
DSL = Direct Screening Level. These levels are based on current toxicity data and standard reesidential exposure assumptons (USEPA Region III Senior Toxicologist, Dr. Roy Smith).
LSL = Leaching Screening Level. These levels are based on an equilibrium partitioning approach which describes the relationship between acceptable soil concentrations and acceptable leachate concentrations.
* = DSLs and LSLs were not available for sodium; therefore, it is listed for SWMUs where it exceeded background.

Table 3-18 ***Human Health Constituents of Potential Concern in Ground Water***
Occidental Chemical Corporation

SWMU	Inorganic Constituents Greater than Screening Levels	Organic Constituents Greater than Screening Levels
WL-1 (Waste Lake No. 1)	Arsenic Cadmium Iron* Manganese Mercury Sodium*	Benzene Bis (2-chlorethyl)ether Bis(2-chlorisopropyl)ether Bis (2-ethylhexyl)phthalate Chlorobenzene 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene Methylene Chloride 1,2,4-Trichlorobenzene Vinyl Chloride
WL-2 (Waste Lake No. 2)	Iron* Manganese Sodium*	none
WL-3 (Waste Lake No. 3)	none	Bis(2-ethylhexyl)phthalate
OBSL (Old Brine Sludge Landfill)	Iron* Manganese Sodium*	none
NBSL (New Brine Sludge Landfill)	Iron* Manganese Mercury	none
Chemfix Test Unit	Mercury	Carbon Tetrachloride Vinyl Chloride

Notes:
Screening levels reflect MCLs where available. In the absence of MCLs, screening levels were calculated based on current toxicity indices and standards residential exposure assumptions (USEPA Region III Senior Toxicologist, Dr. Roy Smith).

* = Screening levels were not available for iron and sodium. Sodium is listed for SWMUs where it exceeded background. Iron is listed for SWMUs where it was positively detected.

Table 3-19 ***List of Observed Vegetation within Each Habitat Covertype***
Occidental Chemical Corporation

Common Name	Scientific Name
UPLAND HERBACEOUS COVERTYPE	
Trees	
Black locust	*Robinia pseud-acacia*
Shrubs/Saplings	
Autumn olive	*Elaeagnus umbellata*
Smooth sumac	*Rhus glabra*
Groundsel-tree	*Baccharis halimifolia*
Multiflora rose	*Rosa multiflora*
Herbaceous Ground Cover	
Broom sedge	*Andropogon virginicus*
* Common reed	*Phragmites australis*
* Crown vetch	*Coronilla varia*
Meadow foxtail	*Alopecurus pratensis*
* Perennial bentgrass	*Agrostis perennans*
* Perennial ryegrass	*Lolium perenne*
Round-headed bush-clover	*Lespedeza capitata*
Slender bush-clover	*Lespedeza virginica*
Small white aster	*Aster vimineus*
Switchgrass	*Panicum virgatum*
FORESTED UPLAND COVERTYPE	
Trees	
American crabapple	*Pyrus coronaria*
Apple	*Pyrus malus*
* Black locust	*Robinia pseud-acacia*
Black willow	*Salix nigra*
Mulberry	*Morus sp.*
Pin cherry	*Prunus pensylvanica*
Red cedar	*Juniperus virginiana*
* Red maple	*Acer rubrum*
Sassafras	*Sassafras albidum*
Smooth sumac	*Rhus glabra*
Shrubs/Saplings	
* Blackberry	*Rubus allegheniensis*
Groundsel-tree	*Baccharis halimifolia*
* Northern arrowwood	*Viburnum recognitum*
Northern bayberry	*Myrica pensylvanica*
Silky dogwood	*Cornus amomum*
Herbaceous Ground Cover	
* Common reed	*Phragmites australis*
* Japenese Honeysuckle	*Lonicera japonica*
SCRUB/SHRUB WETLAND COVERTYPE	
Trees	
* False indigo	*Amorpha fruticosa*
Sweet gum	*Liquidambar styraciflua*

Table 3-19 ***List of Observed Vegetation within Each Habitat Covertype (Con't)***
Occidental Chemical Corporation

Common Name	Scientific Name
SCRUB/SHRUB WETLAND COVERTYPE (Con't)	
Shrubs/Saplings	
Blackberry	*Rubus allegheniensis*
Green ash saplings	*Fraxinus pennsylvanica*
* Groundsel-tree	*Baccharis halimifolia*
* Northern bayberry	*Myrica pensylvanica*
Poison ivy	*Toxicodendron radicans*
Herbaceous Ground Cover	
American bittersweet	*Celastrus scandens*
* Broom sedge	*Andropogon virginicus*
Common reed	*Phragmites australis*
Seaside goldenrod	*Solidago sempervirens*
Lance-leaved goldenrod	*Solidago graminifolia*
Meadow foxtail	*Alopecurus pratensis*
Pokeweed	*Phytolacca americana*
Rough barnyard grass	*Echinochloa muricata*
Soft rush	*Juncus effusus*
Swamp rosemallow	*Hibiscus moscheutos*
* Switchgrass	*Panicum virgatum*
Wild lettuce	*Lactuca canadensis*
EMERGENT WETLAND COVERTYPE	
Herbaceous Ground Cover	
* Common reed	*Phragmites australis*
Smooth cordgrass	*Spartina alterniflora*
Soft stem bulrush	*Scirpus validus*
Switchgrass	*Panicum virgatum*

* Dominant species within covertype

Table 3-20 ***List of Expected and Observed Wildlife within Each Habitat Covertype***
Occidental Chemical Corporation

Common Name	Scientific Name	Open Water	Forested Upland	Scrub-Shrub Wetland	Emergent Wetland	Upland Herbaceous	Mudflats/ Open Water
Amphibians							
American toad	- *Bufo americanus*	√	√	√		√	√
Bullfrog	- *Rana catesbeiana*	√			√		√
Chorus frog	- *Pseudacris triseriata*	√	√	√			√
Dusky salamander	- *Desmognathus fuscus*	√	√	√			√
Eastern newt	- *Notophthalmus viridescens*	√					√
Gray treefrog	- *Hyla versicolor*	√	√	√			√
Green frog	- *Rana clamitans*	√			√		√
Green treefrog	- *Hyla cinerea*	√	√	√			√
Mud salamander	- *Pseudotriton montanus*	√		√			√
Northern cricket frog	- *Acris crepitans*	√	√	√			√
Pickerel frog	- *Rana palustris*	√			√		√
Red-backed salamander	- *Plethodon cinereus*	√	√	√			√
Southern leopard frog	- *Rana sphenocephala*	√			√		√
Spring peeper	- *Hyla crucifer*	√	√	√			√
Two-lined salamander	- *Eurycea bislineata*	√	√	√			√
Reptiles							
Brown snake	- *Storeria dekayi*		√	√		√	√
Common garter snake	- *Thamnophis sirtalis*		√	√		√	
Eastern box turtle	- *Terrapene carolina*		√	√		√	
Eastern ribbon snake	- *Thamnophis sauritus*		√	√		√	
Milk snake	- *Lampropeltis triangulum*		√	√		√	
Mud turtle	- *Kinosternon subrubrum*	√		√	√		√
Northern water snake	- Nerodia sipedon	√		√	√		√
Painted turtle	- *Chrysemys picta*	√			√		√
Racer	- *Coluber constrictor*		√	√		√	
Rat snake	- *Elaphe obsoleta*		√	√		√	
Red-bellied turtle	- *Chrysemys rubriventris*	√			√		√
Smooth green snake	- *Opheodrys vernalis*		√	√		√	
Snapping turtle	- *Chelydra serpentina*	√			√		√
Spotted turtle	- *Clemmys guttata*	√			√		√
Fish							
Alewife	- *Alosa pseudoharengus*	√					√
American eel	- *Anguilla rostrata*	√					√
American shad	- *Alosa sapidissima*	√					√
Atlantic croaker	- *Micropogonias undulatus*	√					√
Atlantic menhaden	- *Brevoortia tyrannus*	√					√
Atlantic silverside	- *Menidia menidia*	√					√
Banded killifish	- *Fundulus diaphanus*	√					√
Bay anchovy	- *Anchoa mitchilli*	√					√
Black crappie	- *Pomoxis nigromaculatus*	√					√
Black drum	- *Pogonias cromis*	√					√
Bluefish	- *Pomatomus saltatrix*	√					√
Bluegill	- *Lepomis macrochirus*	√					√
Brown bullhead	- *Ictalurus nebulosus*	√					√
Channel catfish	- *Ictalurus punctatus*	√					√
Common carp	- *Cyprinus carpio*	√					√
Eastern mudminnow	- *Umbra pygmaea*	√					√
Gizzard shad	- *Dorosoma cepedianum*	√					√
Golden shiner	- *Notemigonus crysoleucas*	√					√
Hogchoker	- *Trinectes maculatus*	√					√
Largemouth bass	- *Micropterus salmoides*	√					√
Naked goby	- *Gobiosoma bosci*	√					√
Northern pipefish	- *Syngnathus fuscus*	√					√
Pumpkinseed	- *Lepomis gibbosus*	√					√
Spot	- *Leiostomus xanthurus*	√					√
Striped bass	- *Morone saxatilis*	√					√
Summer flounder	- *Paralichthys dentatus*	√					√
Tessellated darter	- *Etheostoma olmstedi*	√					√
Weakfish	- *Cynoscion regalis*	√					√
White catfish	- *Ictalurus catus*	√					√
White perch	- *Morone americana*	√					√

Table 3-20 ***List of Expected and Observed Wildlife within Each Habitat Covertype (Con't)***
Occidental Chemical Corporation

Common Name	Scientific Name	Open Water	Forested Upland	Scrub-Shrub Wetland	Emergent Wetland	Upland Herbaceous	Mudflats/ Open Water
White sucker	- *Catostomus commersoni*	√					√
Yellow perch	- *Perca flavescens*	√					√
<u>Birds</u>							
American black duck	- *Anas rubripes*	√					√
American crow	- *Corws brachyrhynchos*		√√	√		√√	
American goldfinch	- *Carduelis tristis*		√	√		√	
American kestrel	- *Falco sparverius*		√	√		√√	
American robin	- *Turdus migratorius*		√	√		√√	
American tree sparrow	- *Spizella arborea*		√	√		√	
American wigeon	- *Anas americana*	√					√
American woodcock	- *Scolopax minor*			√			
Black vulture	- *Coragyps atratus*		√			√	
Black-and-white warbler	- *Mniotilta varia*		√	√			
Black-capped chickadee	- *Parus atricapillus*		√	√			
Black-crowned night-heron	- *Nycticorax nycticorax*	√					√
Blue jay	- *Cyanocitta cristata*		√	√			
Brown thrasher	- *Toxostoma rufum*		√	√			
Canada goose	- *Branta canadensis*	√√		√		√	√
Cattle egret	- *Bubulcus ibis*	√					√
Chimney swift	- *Chaetura pelagica*		√	√		√	
Chipping sparrow	- *Spizella passerina*		√	√		√	
Common grackle	- *Quiscalus quiscula*		√√	√		√	
Common snipe	- *Gallinago gallinago*			√			
Common yellowthroat	- *Geothlypis trichas*		√	√			
Double-crested cormorant	- *Phalacrocorax auritus*	√√					√
Downy woodpecker	- *Picoides pubescens*		√	√			
Eastern kingbird	- *Tyrannus tyrannus*		√	√		√	
Eastern meadowlark	- *Sturnella magna*		√			√	
Eastern phoebe	- *Sayornis phoebe*		√	√			
Eastern wood-pewee	- *Contopus virens*		√	√			
European starling	- *Sturnus vulgaris*		√√	√		√√	
Field sparrow	- *Spizella pusilla*		√	√		√	
Fish crow	- *Corws ossifragus*		√	√			
Gray catbird	- *Dumetella carolinensis*		√	√			
Great blue heron	- *Ardea herodias*	√					√
Great egret	- *Casmerodius albus*	√√					√
Greater yellowlegs	- *Tringa melanoleuca*	√					√
Green-backed heron	- *Butorides striatus*	√					√
Green-winged teal	- *Anas crecca*	√					√√
Hairy woodpecker	- *Picoides villosus*		√	√			
Herring gull	- *Larus argentatus*	√√				√	√
House finch	- *Carpodacus mexicanus*		√	√		√	
House sparrow	- *Passer domesticus*		√	√		√√	
House wren	- *Troglodytes aedon*		√	√		√	
Lesser yellowlegs	- *Tringa flavipes*	√					√
Little blue heron	- *Egretta caerulea*	√					√
Mallard	- *Anas platyrhynchos*	√		√			√
Marsh wren	- *Cistothorus palustris*			√	√		
Mourning dove	- *Zenaida macroura*		√√	√		√√	
Northern bobwhite	- *Colinus virginianus*		√	√		√	
Northern cardinal	- *Cardinalis cardinalis*		√	√		√	
Northern flicker	- *Colaptes auratus*		√√	√		√√	
Northern harrier	- *Circus cyaneus*		√√	√		√√	
Northern mockingbird	- *Mimus polyglottos*		√	√		√	
Northern oriole	- *Icterus galbula*		√	√			
Northern shoveler	- *Anas clypeata*	√					√√
Osprey	- *Pandion haliaetus*	√√					√
Purple finch	- *Carpodacus purpureus*		√	√		√√	
Red-bellied woodpecker	- *Melanerpes carolinus*		√	√			
Red-eyed vireo	- *Vireo olivaceus*		√	√			
Red-tailed hawk	- *Buteo jamaicensis*		√	√		√	
Red-winged blackbird	- *Agelaius phoeniceus*		√	√	√	√	

Table 3-20 ***List of Expected and Observed Wildlife within Each Habitat Covertype (Con't)***
Occidental Chemical Corporation

Common Name	Scientific Name	Open Water	Forested Upland	Scrub-Shrub Wetland	Emergent Wetland	Upland Herbaceous	Mudflats/ Open Water
Rufous-sided towhee	- *Pipilo erythrophthalmus*		√	√			
Savannah sparrow	- *Passerculus sandwichensis*		√	√		√√	
Semipalmated sandpiper	- *Calidris pusilla*						√
Slate-colored junco	- *Junco hyemalis*		√	√		√	
Snow goose	- *Chen caerulescens*	√√					√
Snowy egret	- *Egretta thula*	√					√
Song sparrow	- *Melospiza melodia*		√√	√√		√√	
Spotted sandpiper	- *Actitis macularia*						√
Swamp sparrow	- *Melospiza georgiana*			√	√		
Tricolored heron	- *Egretta tricolor*	√					√
Tufted titmouse	- *Parus bicolor*		√	√			
Turkey vulture	- *Cathartes aura*		√	√		√	
White-throated sparrow	- *Zonotrichia albicollis*		√	√		√	
Wood duck	- *Aix sponsa*	√					√
Yellow-crowned night-heron	- *Nyctanassa violacea*	√					√
Yellow warbler	- *Dendroica petechia*		√	√			
Yellow-rumped warbler	- *Dendroica coronata*		√	√			
Mammals							
Eastern chipmunk	- *Tamias striatus*		√	√		√	
Eastern cottontail	- *Sylvilagus floridanus*		√	√		√	
Eastern gray squirrel	- *Sciurus carolinensis*		√	√			
Least shrew	- *Cryptotis parva*		√	√		√	
Long-tailed weasel	- *Mustela frenata*		√	√		√	√
Marsh rice rat	- *Oryzomys plustris*			√	√		√
Meadow jumping mouse	- *Zapus hudsonius*		√	√		√	
Meadow vole	- *Microtus pennsylvanicus*		√	√		√	
Mink	- *Mustela vison*		√	√		√	√
Muskrat	- *Ondatra zibethicus*	√		√	√	√	√
Northern short-tailed shrew	- *Blarina brevicauda*		√	√		√	
Raccoon	- *Procyon lotor*		√	√√	√	√	√√
Red fox	- *Vulpes fulva*		√	√		√	
Star-nosed mole	- *Condylura cristata*	√		√	√	√	√
Striped skunk	- *Mephitis mephitis*		√	√		√	√
Virginia opossum	- *Didelphis virginiana*		√	√		√	
White-footed mouse	- *Peromyscus leucopus*		√	√		√	
White-tailed deer	- *Odocoileus virginianus*		√	√√	√	√	√√
Woodchuck	- *Marmota monax*		√√	√		√	

√ Species expected to occur within the specified habitat covertype
√√ Species observed within the specified habitat covertype during the field reconnaissance survey

Table 3-21 ***List of Rare Plant and Wildlife Species Known to Occur Within the Vicinity of the Site Occidental Chemical Corporation***

Common Name	Scientific Name	Legal Status	State Rank	Federal Status
Plant Species				
American frog-bit	*Limnobium spongia*		S1	
Bulb-bearing water hemlock	*Cicuta bulbifera*		S1	
Bur-marigold	*Bidens bidnetoides*		S1	
Crinkled hairgrass	*Deschampsia flexuosa*		S3	
Gray birch	*Betula populifolia*		S2	
Mountain mint	*Pycnanthemum muticum*		S2	
Poison sumac	*Toxicodendron vernix*		S2	
River-bank quillwort	*Isoetes riparia*		S1	
Swamp pink	*Helonias bullata*		-	FE
Weakstalk bulrush	*Scirpus purshianus*		S2	
Amphibians				
Four-toed salamander	*Hemidactylium scutatum*		S1	
Reptiles				
Bog turtle	*Clemmys muhlenbergii*	SE	S1	
Eastern king snake	*Lampropeltis getula*		S2	
Queen snake	*Regina septemvittata*		S1	
Fish				
Shortnose sturgeon	*Acipenser brevirostrum*	SE	S1	FE
Birds				
Baird's sandpiper	*Calidris bairdii*		S2T	
Bald eagle	*Haliaeetus leucocephalus*	SE	S1B	FE
Black-crowned night-heron	*Nycticorax nycticorax*		S2B	
Black-necked stilt	*Himantopus mexicanus*		S2	
Buff-breasted sandpiper	*Tryngites subruficollis*		S1T	
Cattle egret	*Bubulcus ibis*		S2B	
Glossy ibis	*Plegadis falcinellus*		S2B	
Great blue heron	*Ardea herodias*		S2B	
Great egret	*Casmerodius albus*		S2B	
Iceland gull	*Larus glaucoides*		S2N	
Little blue heron	*Egretta caerulea*		S2B	
Long-eared owl	*Asio otus*		S2N	
Peregrine falcon	*Falco peregrinus*	SE	S1	FE
Snowy egret	*Egretta thula*		S1B	
Tricolored heron	*Egretta tricolor*		S1B	
Warbling vireo	*Vireo gilvus*		S2B	
Yellow-crowned night-heron	*Nyctanassa violacea*		S1B	

SE: State Endangered
FE: Federally Endangered
S1: Extremely rare, typically 5 or fewer occurrences
S2: Very rare, typically between 6 and 20 occurrences
S3: Rare to uncommon, typically 21 to 100 occurrences
Modifiers
B: Breeding status
N: Regularly occurring, usually migratory

Table 3-22 ***Ecological Surface Soil Constituents of Potential Concern***
Occidental Chemical Corporation

SWMU	Inorganic Constituents Greater than Background Concentrations	Organic Constituents Greater than Background Concentrations
Waste Lake No. 1	Barium	
Waste Lake No. 2	Barium	1,2-Dichlorobenzene
	Cadmium	1,4-Dichlorobenzene
	Copper	1,2,4-Trichlorobenzene
	Lead	Bis(2-ethylhexyl) phthalate
	Manganese	Butyl benzyl phthalate
	Mercury	
	Nickel	
	Sodium	
	Zinc	
Former Storm Drainage Pond	Barium	
	Manganese	
	Mercury	
	Nickel	
	Sodium	
	Zinc	

Table 3-23 Ecological Shallow Ground Water Constituents of Potential Concern
Occidental Chemical Corporation

SWMU	Inorganic Constituents Greater than AWQC, LOEL, or Background Concentration*	Organic Constituents Greater than AWQC, LOEL, or Background Concentration*
Waste Lake No. 1	Arsenic Iron Manganese Mercury Sodium	Benzene Chlorobenzene Methylene chloride Vinyl chloride 1,2,4-Trichlorobenzene 1,2-Dichlorobenzene 1,3-Dichlorobenzene 1,4-Dichlorobenzene
Waste Lake No. 2	Barium Iron Manganese Nickel Sodium Zinc	
Waste Lake No. 3	Selenium Zinc	Bis(2-ethylhexyl) phthalate
Chem-Fix Test Unit	Manganese Mercury	Vinyl chloride
Old Brine Sludge Landfill	Barium Iron Manganese Sodium Zinc	
New Brine Sludge Landfill	Barium Iron Manganese Mercury Zinc	Bis(2-ethylhexyl) phthalate

* Note: The above constituents were detected above AWQC, LOELs, or background concentrations. More specifically, if AWQC or LOELs were not available, then the constituents were considered constituents of potential concern. Zinc was evaluated based solely on AWQC and was not compared to background concentrations.

Table 3-24 Ecological Deep Ground Water Constituents of Potential Concern
Occidental Chemical Corporation

SWMU	Inorganic Constituents Greater than AWQC, LOEL, or Background Concentration*	Organic Constituents Greater than AWQC, LOEL, or Background Concentration*
Waste Lake No. 1	Barium Cadmium Manganese Mercury Zinc	Chlorobenzene Methylene chloride 1,2,4-Trichlorobenzene 1,2-Dichlorobenzene 1,4-Dichlorobenzene Bis(2-Chloroethyl)ether Bis(2-Chloroisopropyl)ether Bis(2-ethylhexyl) phthalate
Waste Lake No. 2	Barium Iron Manganese Zinc	
Chem-Fix Test Unit		Vinyl chloride
New Brine Sludge Landfill	Manganese Mercury Selenium Zinc	

* Note: The above constituents were detected above AWQC, LOELs, or background concentrations. More specifically, if AWQC or LOELs were not available, then the constituents were considered constituents of potential concern. Zinc was evaluated based solely on AWQC and was not compared to background concentrations.

Section 4

4.0 PHASE I CONCLUSIONS

The following conclusions can be made regarding OxyChem's Delaware City facility following the Phase I RFI:

- The facility has been in operation for over 30 years. During this time, up to 17 on-site areas now termed SWMUs under RCRA were used to manage facility process materials and wastes. Existing data for 10 of the SWMUs showed no evidence of release of constituents to the environment and were not initially investigated during Phase I.
- The seven remaining SWMUs were of concern and source area investigations were implemented during this RFI. This data showed that constituents indicative of facility operations were present in the soil at several locations. However, sufficient soil boring, geophysical and chemical data have been collected to determine the volume and characteristics of waste materials in the soil at these SWMUs. Phase II activities will focus on characterization of the overall ground water, surface water and sediment impacts associated with these SWMUs.
- Phase I data and on-going plant activities have provided new information that warrants limited source area characterization of several areas not investigated in Phase I. These areas are: the Sand Blast Grit Area, the former carbon tetrachloride "gunk" and storage tanks, the wastewater treatment plant and chemical process wastewater sewers.
- The facility is located in a rural/industrial area with no residential areas or private drinking water wells within one mile. Potential impacts resulting from releases from the plant to ground water are limited to ecological receptors in Red Lion Creek and the adjacent wetland areas. Potential human receptors are limited to recreational use and low income subsistence fisherman that may eat fish caught in Red Lion Creek. Since access to onsite waste material and potentially affected soil is restricted by dense vegetation and clay or soil caps, direct human contact is unlikely.
- In waste samples collected from the SWMUs, VOCs consisting of benzene, vinyl chloride, and carbon tetrachloride; SVOCs consisting of chlorinated benzenes and bis(2-ethylhexyl)phthalate, and the metals barium and mercury were detected at elevated concentrations and serve as indicator constituents of the wastes managed at the facility.

  In the surface soil samples, the indicator constituents were generally either undetected or within background concentrations.

In subsurface soil sampled downgradient of each SWMU (with the exception of WL-2), the inorganic indicator constituents were generally undetected or within background concentrations. Some subsurface soil samples did, however, contain elevated concentrations of these constituents.

TCLP analyses were performed at four SWMUs. Regulatory limits for benzene and 1,4DCBZ were exceeded at WL-1 and the OBSL. No inorganic constituents exceeded TCLP criteria.

- Three ground water flow regimes are present beneath the facility. A discontinuous perched water table is present in the eastern portion of the facility. The Columbia Aquifer is present across the site and represents the surficial water table aquifer. Water quality data from nested wells in the shallow and deep portions of the Columbia reveal generally higher concentrations in the shallow zone.

  The Potomac Aquifer underlies the Columbia and is confined. A review of published hydrogeologic information from the facility and the adjacent Standard Chlorine facility collected as a result of on-site investigations, indicates that the Columbia and Potomac Aquifers do not appear to be hydraulically connected. However, additional evaluation of the chemical quality and flow gradients in the Potomac Aquifer are warranted to better understand this aquifer's connection to the Columbia Aquifer.

- Vertical gradients in the Columbia Aquifer are very small indicating predominant lateral flow toward Red Lion Creek. The average horizontal ground water flow velocity in the Columbia Aquifer is 1 foot/day. Hydraulic conductivity values in the Columbia Aquifer ranged from 0.04 ft/day to 472 ft/day.

- VOCs, SVOCs, and mercury were detected in wells downgradient of WL-1 at concentrations which indicate that constituents are migrating from WL-1 and warrant further evaluation in Phase II.

- Elevated levels of VOCs were detected in samples from the waste borings, soil borings, and in ground water at concentrations which indicate that these constituents are migrating from the Chemfix Test Unit and warrant further evaluation in Phase II.

- The ground water data indicate that the constituents detected in the soil and waste boring samples are not migrating from WL-2. Elevated levels of VOCs, SVOCs, and mercury were detected in some of the waste boring samples and one of the surface soil samples.

- In WL-3 waste boring samples, VOCs and SVOCs were detected above screening levels. However, with the exception of bis(2-ethylhexyl)phthalate which was detected in well R-112 above the

MCL, the data indicate that the constituents detected in the waste samples are not migrating from WL-3.

- No constituents indicative of plant activities were detected in the surface soil samples collected from the Former Storm Drainage Pond South of WL-1.
- Low levels of dissolved mercury were detected in three wells that monitor the NBSL which indicates that mercury may be migrating from this SWMU. This SWMU was recently closed however, and will be continuously monitored as part of the RCRA post-closure permit.
- The remaining SWMUs, where constituents were detected in waste materials but not in the ground water or surface soil, will be addressed in the Corrective Measures Study based on potential risks to human health and the environment.

Section 5

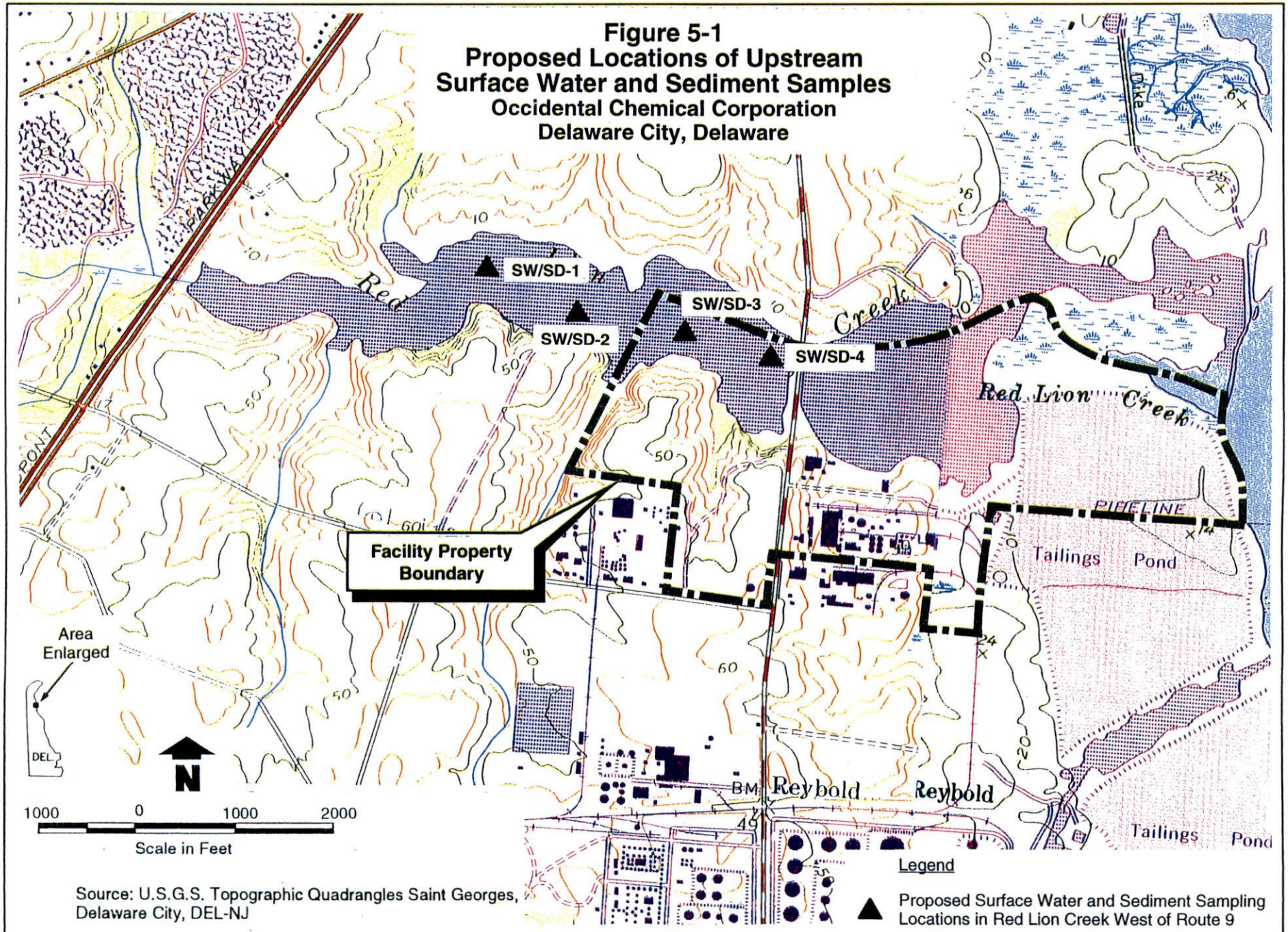
5.0 PHASE II SCOPE OF WORK

The purpose of the Phase II RFI is to identify and characterize constituent migration pathways. The pathways include the ground water migration pathway both in the active production areas of the facility and also the disposal impoundment areas. It also will include the surface water and sediment migration pathway in Red Lion Creek and the adjacent estuary. In addition, limited additional source area characterization will be conducted at a newly identified SWMU and in the active plant processing area. As part of the Phase II Work Plan development, a limited risk screening evaluation will be conducted whereby Phase I analytical data will be evaluated against risk based concentrations in order to identify contaminants of concern for further evaluation during the RFI. A separate Phase II RFI Work Plan will be developed and submitted to EPA for review.

Section 5 Figures

THE ERM GROUP

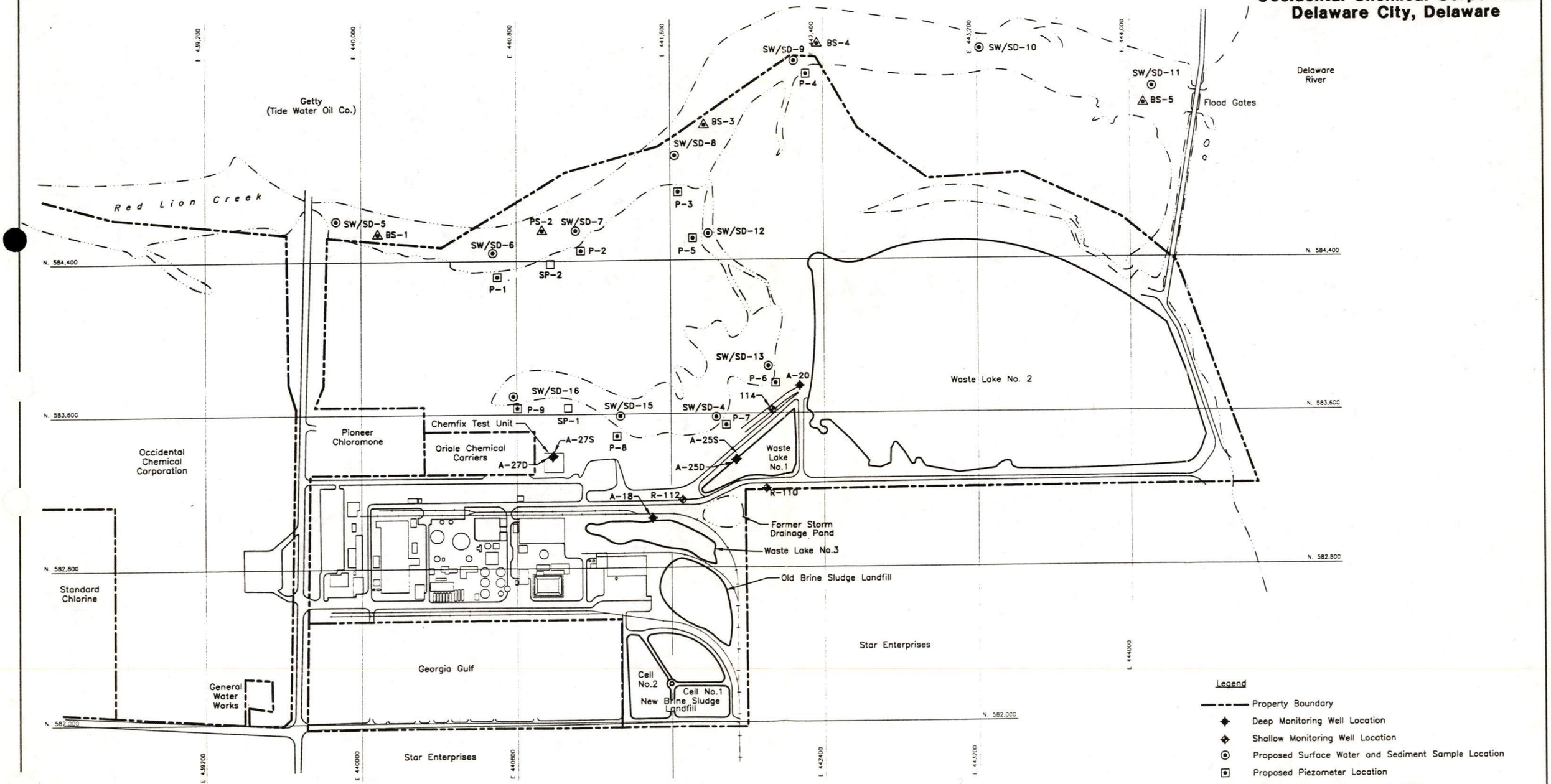
Figure 5-1
Proposed Locations of Upstream Surface Water and Sediment Samples
Occidental Chemical Corporation
Delaware City, Delaware



Source: U.S.G.S. Topographic Quadrangles Saint Georges, Delaware City, DEL-NJ

72209.07.01 / DG 8.16.93 / rev. 5-27-94

Figure 5-2
Proposed Sample Location Map for Phase II Investigation Activities
Occidental Chemical Corporation
Delaware City, Delaware



Legend

- Property Boundary
- Deep Monitoring Well Location
- Shallow Monitoring Well Location
- Proposed Surface Water and Sediment Sample Location
- Proposed Piezometer Location
- Proposed Shallow Piezometer Location
- Proposed Biological Sampling Locations

72209.07.01/04.01.94-MKB/06.01.94-MKB/A201-3

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Section 5 Tables

Table 5-1
Phase II Field Sampling and Analyses
Occidental Chemical Corporation
Delaware City, Delaware

Activity	Unit/Area	Sample/Well Number	Sample Method	Chemical Analysis	Intent
Surface Water and Sediment Sampling	Red Lion Creek (RLC) West of Rt. 9	SW-1 SD-1	Grab	Organics, Wet Chem, Mercury	Characterize surface water and sediment of RLC upstream and downstream of Standard Chlorine
		SW-2 SD-2	Grab	Organics, Wet Chem, Mercury	
		SW-3 SD-3	Grab	Organics, Wet Chem, Mercury	
		SW-4 SD-4	Grab	Organics, Wet Chem, Mercury	
	RLC East of Rt.9	SW-5 SD-5	Grab	Organics, Wet Chem, Mercury	Characterize surface water and sediment of RLC downstream of Standard Chlorine and downgradient of the OxyChem Facility
		SW-6 SD-6	Grab	Organics, Wet Chem, Mercury	
		SW-7 SD-7	Grab	Organics, Wet Chem, Mercury	
		SW-8 SD-8	Grab	Organics, Wet Chem, Mercury	
		SW-9 SD-9	Grab	Organics, Wet Chem, Mercury	
		SW-10 SD-10	Grab	Organics, Wet Chem, Mercury	
		SW-11 SD-11	Grab	Organics, Wet Chem, Mercury	
	RLC Tributary North of WL-1 and The Chemfix Test Unit	SW-12 SD-12	Grab	Organics, Wet Chem, Mercury	Characterize surface water and sediment of the RLC trib. down-gradient of WL-1 and the Chemfix Test Unit.
		SW-13 SD-13	Grab	Organics, Wet Chem, Mercury	
		SW-14 SD-14	Grab	Organics, Wet Chem, Mercury	
		SW-15 SD-15	Grab	Organics, Wet Chem, Mercury	
		SW-16 SD-16	Grab	Organics, Wet Chem, Mercury	
Pore Water Sampling	RLC	SP-2	Grab	Organics, Wet Chem, Mercury	Characterize exposure point concentrations of constituents.
	RLC Tributary North of WL-1 and The Chemfix Test Unit	SP-1	Grab	Organics, Wet Chem, Mercury	Characterize exposure point concentrations of constituents.

Organics: benzene, chlorobenzene, dichlorobenzene, trichlorobenzene, vinyl chloride, carbon tetrachloride
Wet Chem: hardness, alkalinity, TDS, TSS, TOC, chloride, sulfate, total phosphorus, nitrate-N, nitrite-N, ammonia-N, (dissolved oxygen, conductivity, pH, temperature)*
Sediment Wet Chem. Parameters: TOC and grain size
* Field measurements

Table 5-1 (con't)
Phase II Field Sampling and Analyses
Occidental Chemical Corporation
Delaware City, Delaware

Activity	Unit/Area	Sample/Well Number	Sample Method	Chemical Analysis	Intent
Biological Sampling	RLC	BS-1, BS-2, BS-3, BS-4	See Text	No Chemical Analysis	Assess fish and macro-invertebrate community structure.
Ground Water Sampling	RLC West of Rt.9	P-1	Grab	Organics, Wet Chem, Mercury	Characterize ground water discharging to RLC and the tributary downgradient of WL-1 and the Chemfix Test Unit.
		P-2	Grab	Organics, Wet Chem, Mercury	
		P-3	Grab	Organics, Wet Chem, Mercury	
		P-4	Grab	Organics, Wet Chem, Mercury	
	RLC Tributary North of WL-1 and The Chemfix Test Unit	P-5	Grab	Organics, Wet Chem, Mercury	
		P-6	Grab	Organics, Wet Chem, Mercury	
		P-7	Grab	Organics, Wet Chem, Mercury	
		P-8	Grab	Organics, Wet Chem, Mercury	
		P-9	Grab	Organics, Wet Chem, Mercury	
	Wells Upgradient of RLC	A-27S	Grab	Organics, Wet Chem, Mercury	
		A-27D	Grab	Organics, Wet Chem, Mercury	
		A-18	Grab	Organics, Wet Chem, Mercury	
		R-112	Grab	Organics, Wet Chem, Mercury	
		A-25S	Grab	Organics, Wet Chem, Mercury	
		A-25D	Grab	Organics, Wet Chem, Mercury	
		R-110	Grab	Organics, Wet Chem, Mercury	
		A-20	Grab	Organics, Wet Chem, Mercury	
		114	Grab	Organics, Wet Chem, Mercury	

Organics: benzene, chlorobenzene, dichlorobenzene, trichlorobenzene, vinyl chloride, carbon tetrachloride
Wet Chem: hardness, alkalinity, TDS, TSS, TOC, chloride, sulfate, total phosphorus, nitrate-N, nitrite-N, ammonia-N, (dissolved oxygen, conductivity, pH, temperature)*
Sediment Wet Chem. Parameters: TOC and grain size
* Field measurements

Table 5-2
Draft Schedule for Phase II Activities
Occidental Chemical Corporation
Delaware City, Delaware

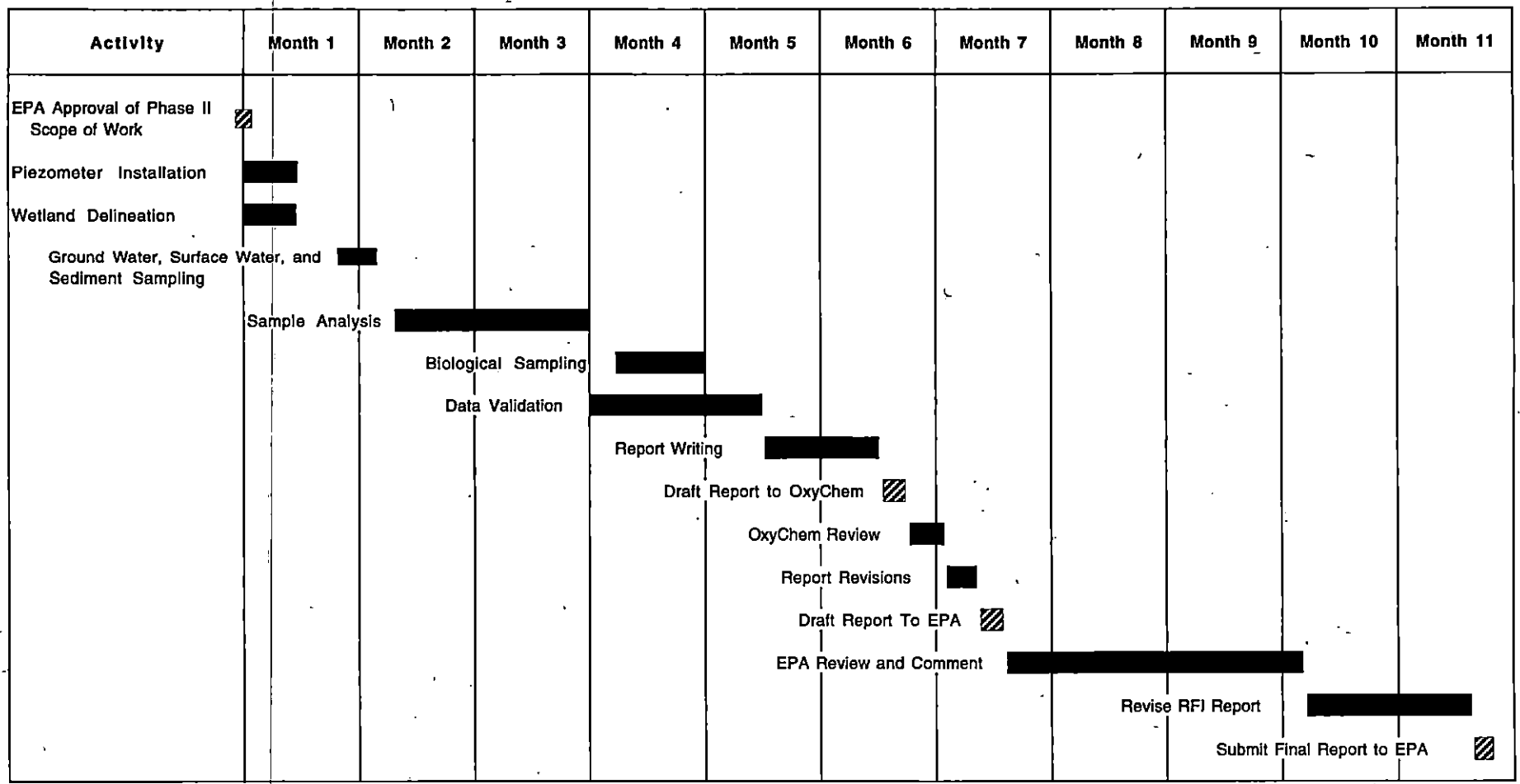

Table 5-3
Preliminary Estimate of Schedule for RCRA Facility Investigation
Occidental Chemical Corporation - Delaware City, Delaware

EPA Approval of Phase II Scope of Work	Year 2												Year 3												Year 4					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
Project Task																														
1. Agency Review and Approval																														
2. Phase II Investigation														Submit Phase II Report/Phase III Work Plan																
3. Agency Review and Approval																														
4. Phase III Investigation																									Submit Phase III Report					
5. Agency Review and Approval																														

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ENVIRONMENTAL RESOURCES MANAGEMENT

Final Phase I RCRA Facility Investigation Report

Occidental Chemical Corporation
Delaware City, Delaware

Volume II

Revised 4 December 1996 - Appendix H added

Environmental Resources Management, Inc.
855 Springdale Drive
Exton, Pennsylvania 19341

ERM®

Phase I RCRA Facility Investigation Report

Occidental Chemical Corporation
Delaware City, Delaware

Volume II
Appendices

3 June 1994

Environmental Resources Management, Inc.
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ERM's Commitment to Quality

Our Quality Policy

We will fully understand the requirements of our clients, our jobs, and the systems that support us.

We will conform to those requirements at all times.

Our Quality Goals

To serve you.

To serve you well.

To continually improve that service.

Our Quality Improvement Process

Train each employee.

Establish and implement requirements based on a preventative approach.

Maintain a standing Quality Improvement Team to ensure continuous improvement.

Empower Corrective Action Teams at both company-wide and local levels to correct and eliminate problems.

Continually strive to improve our client and supplier relationships.

Paul H. Woodruff, Chairman

Kent E. Patterson, President and C.E.O.

APPENDICES

A	*Waste Boring Logs, Soil Boring Logs, Well Construction Logs*
B	*Geotechnical Analysis Sheets*
C	*Ground Water Elevation Maps*
D	*Slug Test Data Plots*
E	*Tidal Survey Data Plots*
F	*Quality Assurance Reports*
G	*Data Comparisons to Background Conditions and Regulatory Levels*

Appendix A
Waste Boring Logs
Soil Boring Logs
Well Construction Logs

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-1
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 23 Sept. 1993	Date Completed: 23 Sept. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 14	Ground Surface Elevation: 17.51	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0		9,11,13,12			0 - 3: Top soil, sandy silt		
		10,14,16,15			3 - 4: Red Clay, dry, hard 4 - 4.5: Sandy silt with gravel		
5		5,7,9,11			4.5 - 4.9: PVC pellets 4.9 - 6: Gray, clay-like waste with white banding, wet		
		No Recovery			6 - 8: Shelby Tube; No Recovery		
		1 for 2 feet	82-300		8 - 11.7: Gray, clay-like waste		
10		5,7,6,4			11.7 - 14: Orange-brown fine sand with silt, moist		
		24" Recovery			End of Boring		
15							
20							
25							
30							

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-2
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 22 Sept. 1993	Date Completed: 22 Sept. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 20	Ground Surface Elevation: 20.51	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0						0	
		18,50,55,25			2 - 6.5: Light brown fine to medium gravelly sand		
5						5	
		1/1.5', 1	20		6 - 6.5: Fine sand 6.5 - 7.5: Black, clay-like waste		
		4,6,6,3	100		7.5 - 8: Fine sand 8 - 8.7: Black Waste 8.7 - 9.2: gravelly sand		
10					9.2 - 11: Black waste 11 - 12.4: gravelly sand	10	
		1/1', 1/1'	100		12.4 - 14: Grayish-white waste, PVC pellets at 12.9		
					14 - 14.5: Black waste mixed with sand 14.5 - 16: Gray waste		
15		2,2,3,4	80 - 100		16 - 16.5: Black/gray waste with brown fine sand	15	
		2,2,3,4	300		16.5 - 18.5: Gray/black mottled waste, becomes mixed with sand		
		7,10,11,14	300		18.5 - 20: Brown fine sand with silt, trace gravel, moist		
20					End of Boring	20	
25						25	
30						30	

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-3
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 18 Oct. 1993	Date Completed: 18 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 12	Ground Surface Elevation: 15.71	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0						0 - 3: Brown silt some sand		
		SM	10,8,6,6	10		3 - 9.5: Gray clay		
5			1,2,2,3	100				
			2,3,3,3	200				
		ML	1,1,1,1	50		9.5 - 10.5: Brown sandy silt		
10		ML	1,2,2,3			10.5 - 12: Gray clay, some sand		
						End of Boring		
15								
20								
25								
30						Note: GT = Geotechnical Sample		

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-4
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 18 Oct. 1993	Date Completed: 18 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 8	Ground Surface Elevation: 15.09	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0		3,4,6,12			0 - 2.5: Brown silt with sand and gravel		
		7,12,17,16	20		2.5 - 4.25: Silty sand with gravel		
		8,11,11,9	200		4.25 - 4.75: Gray clay		
5		5,3,2,2			4.75 - 8: Gray very fine sand. Water at 8 feet, oily sheen		
					End of Boring		
10							
15							
20							
25							
30							

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-5
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 18 Oct. 1993	Date Completed: 18 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 17	Ground Surface Elevation: 10.02	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Spft Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0						0 - 4: Brown silt, some sand	0	
		SM	4,5,5,5					
		SM	2,3,2,2	50		4 - 12: Gray peaty clay, phragmites stems		
5			2,2,2,2	100			5	
			1,2,2,2	200				
10		ML	2,1,2,2	100			10	
15		ML	1,1,2,1	50		15 - 17: Grayish brown peat	15	
						End of Boring		
20							20	
25							25	
30							30	

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-6
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 19 Oct. 1993	Date Completed: 19 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 8	Ground Surface Elevation: 10.37	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0					0 - 2.5: Brown sandy silt		
		2,3,1,1	550		2.5 - 3.7: Gray clayey silt to 3.7 3.7 - 5: Gray wet clay		
5		1,1,1,1			5 - 6.5: Gray clayey silt		
		1,1,1,1	350		6.5 - 8: Gray wet clay		
10					End of Boring		
15							
20							
25							
30							

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-7
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 19 Oct. 1993	Date Completed: 19 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 8	Ground Surface Elevation: 10.47	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0		ML	5,7,7,10	2		0 - 3: Silt, organic material, trace gravel		
			6,7,5,7	90		3 - 4.6: Fine sand, trace gravel, some black staining at 4 feet.		
5			5,5,5,5			4.6 - 6: Gray clay with black staining		
		ML	3,2,1,1			6 - 7: Fine sand 7 - 8: Gray wet clay		
10						End of Boring		
15								
20								
25						Note: GT = Geotechnical Sample		
30								

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-8
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 19 Oct. 1993	Date Completed: 19 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 10	Ground Surface Elevation: 11.92	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0						0 - 5: Brown silt, some sand, trace gravel		
			7,11,8,9					
5			7,3,2,2			5 - 10: Gray silty clay, black staining, petroleum odor		
		ML						
			1,2,1,1					
10						End of Boring		
15								
20								
25						Note: GT = Geotechnical Sample		
30								

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-9
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 19 Oct. 1993	Date Completed: 19 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 10	Ground Surface Elevation: 12.67	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0						0 - 4.5: Brown sandy silt,		
		SM	5,9,10,10					
5			6,7,3,4			4.5 - 10: Gray silty clay, black staining, petroleum odor		
			2,2,1,1					
		ML	1,1,1,1					
10						End of Boring		
15								
20								
25						Note: GT = Geotechnical Sample		
30								

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-10
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 21 Sept. 1993	Date Completed: 21 Sept. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 20	Ground Surface Elevation: 26.41	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0						0 - 2: Top soil		
			7,5,6,7	20		2 - 4: Red clay (Clay Cap)		
				>1000		4 - 11: Gray clayey, very fine sand with white PVC pellets		
5			4,5,7,9					
			1,1,2,3	>1000				
				>1000				
10			1,5,7,11			11 - 12: Black waste with white pellets		
			2,2,5,4			12 - 14: Gray clay mixed with white pellets (50/50)		
15			3,1,1,1			14 - 16: White waste and gray clay - banded		
			1/2 feet			16 - 19.5: White pellets		
			1,1,1,1			19.5 - 20: Gray clay		
20						End of Boring		
25								
30								

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-11
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 22 Sept. 1993	Date Completed: 22 Sept. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 14	Ground Surface Elevation: 25.63	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0			8,7,9,10			0 - 0.6: Top soil 0.6 - 2: Clay cap - Red	0	
			4,5,5,6			2 - 6: Sandy gray clay		
5			5,5,7,8				5	
			4,4,6,7	200		6 - 8: Gray medium sand		
			2,2,2,2			8 - 9: Black waste 9 - 9.5: Light brown waste 9.5 - 10: Grayish-white waste		
10			No Recovery			10 - 12: Shelby Tube - No Recovery	10	
			2,2,2,3			12 - 13.25: White granular waste 13.25 - 14: Gray clay		
15						End of Boring	15	
20							20	
25							25	
30							30	

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-12
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 23 Sept. 1993	Date Completed: 23 Sept. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 16	Ground Surface Elevation: 27.32	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0			9,11,13,12			0 - 1: Orange-brown fine sand with silt 1 - 1.5: Brown calyey silt 1.5 - 1.7: gravel 1.7 - 2: Coarse sandy silt 2 - 3: Fine sand with silt, some gravel 3- 14.2: Brown waste, silty texture, trace gravel. Salt lens at 5 feet.	0	
			10,14,16,15					
5			7,8,1110				5	
			24" Recov.					
			21,18,50, 70/5"	1				
10			60, 100/5"	2			10	
15			2,2,3,3			14.2 - 16: Dark gray organic clay	15	
						End of Boring		
20							20	
25							25	
30							30	

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-13
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 23 Sept. 1993	Date Completed: 23 Sept. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 16	Ground Surface Elevation: 26.04	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0						0 - 2.5: Fine sand with silt		
			4,6,6,12			2.5 - 5.6: Brown waste, silty texture some salt granules		
5			17,14,23,27			5.6 - 7: Brown waste		
			24,14,11,10	7		7 - 8.5: White waste (MgSO4 or CaSO4)		
			4,4,5,6			8.5 - 13.5: Brown waste mixed with salt granules. Fine sand layer at 9.2'		
10			6,10,9,11					
			5,7,9,11			13.5 - 14: Peat		
15						End of Boring		
20								
25								
30								

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: WB-14 & WB1
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 22 Sept. 1993	Date Completed: 22 Sept. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 4 & 4.5	Ground Surface Elevation: WB-14: 23.02; WB-14A: 22.86	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0			4,6,5,7			**WB-14**	0	
			3,4,3,3			0 - 1.5: Top soil, clayey silt 1.5 - 4: Gray granular waste, some silty material. Waste had been mixed with cement then placed in a lined cell.		
						End of Boring		
0			4,7,6,6			**WB-14A** 0 - 3: Top soil 3 - 4: Gray sandy, clayey material	0	
			5,3,3,4					
			8" Recov.					
5						End of Boring	5	

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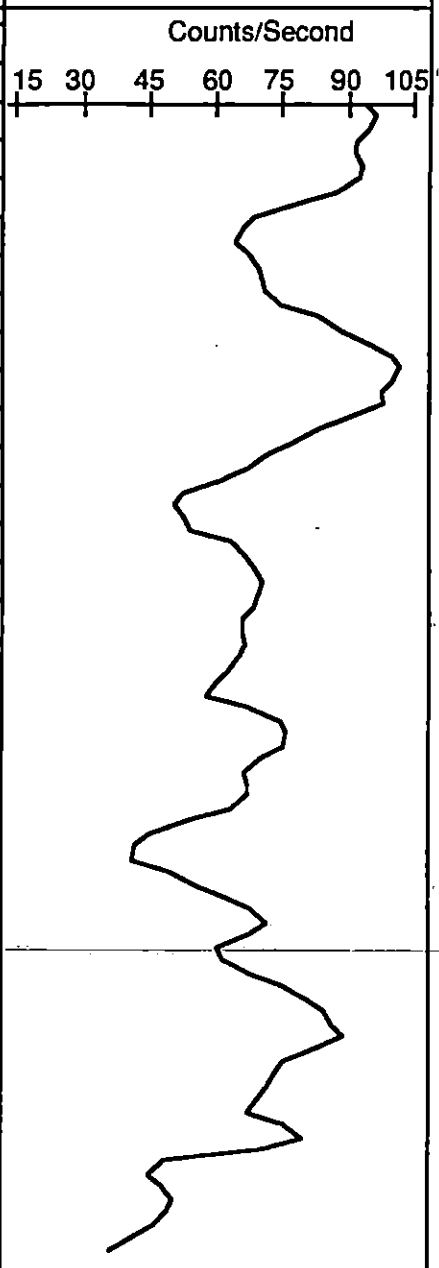
Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-1
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 28 Oct. 1993	Date Completed: 29 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 57	Ground Surface Elevation: 17.87	Inner Casing:	
Initial GW Level: ≈25 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Description
0		SC-SM	18,31,39,50		0 - 1: Gravel mixed with top soil 1 - 2: Brown silt 2 - 4: Tan very fine, silty sand
			12,13,17,23		
5			17,33,21,28		4 - 6: Tan-orange sandy silt. Grades to a fine sand. 6 - 8: Tan-orange fine to medium sand interbedded with clay
		SM	15,13,15,30	0.4	
		ML	7;10,14,11		8 - 15: Tan-orange clay
10			5,6,6,7	37	
15					15 - 28: Fine silty sand
20		SM	6,7,6,6	>1000	
25					28 - 31.3: Tan sandy silt
30					Note: GT = Geotechnical Sample

Geophysical Gamma Log



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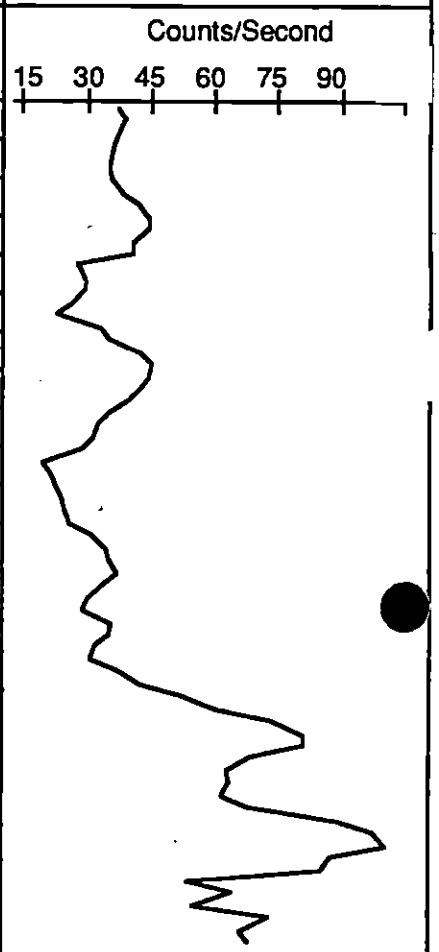
Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-1
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 28 Oct. 1993	Date Completed: 29 Oct. 1993	Screen: NA	From: - To:
Logged By: Charles Salomon	Checked By:	Pack:	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 57	Ground Surface Elevation: 17.87	Inner Casing:	
Initial GW Level: ≈25 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description
30			6,7,6,6			31.3 - 35: Gray fine silty sand
35						35 - 55: Tan-orange medium sand, trace gravel
40		SP	3,6,12,18			
45						
50			No Rec.			50 - 57: Gray dense clay
55			3,7,5,6			
60						End of Boring

Note:
GT = Geotechnical Sample

Geophysical Gamma Log

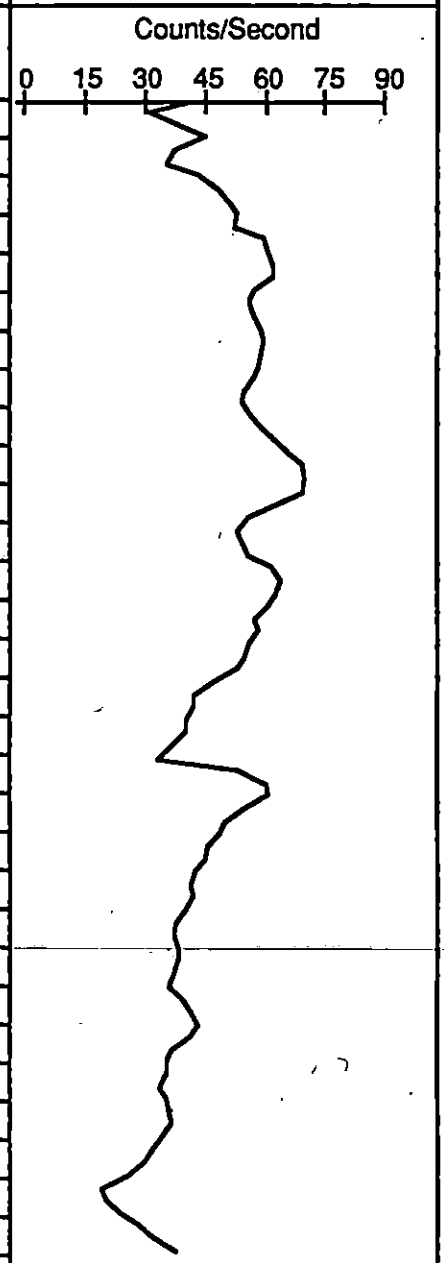


ERM
855 Springdale Drive
Exton, Pennsylvania 19341
(215) 524-3500

Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-2
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 1 Nov. 1993	Date Completed: 3 Nov. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 74	Ground Surface Elevation: 25.48	Inner Casing:	
Initial GW Level: ≈7 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description
0		ML	12,16,25,19			0 - 0.5: Gravel 0.5 - 1: Gray clay 1 - 2: Tan-orange sandy silt 2 - 5: Gray silt
			13,14,23,20			
5			2,2,3,4			5 - 6.8: Tan-orange sandy silt, wet
			5,4,4,4			6.8 - 8: Silty sand, saturated
		SM	6,7,9,7			8 - 10: Dry, sandy silt
10			4,3,4,6			10 - 11: Saturated silty sand 11 - 35: Gray clayey silt, trace sand and gravel
15						
		SM	9,7,5,5			
20						
25						
			2,3,2,2			
30						

Note: GT = Geotechnical Sample



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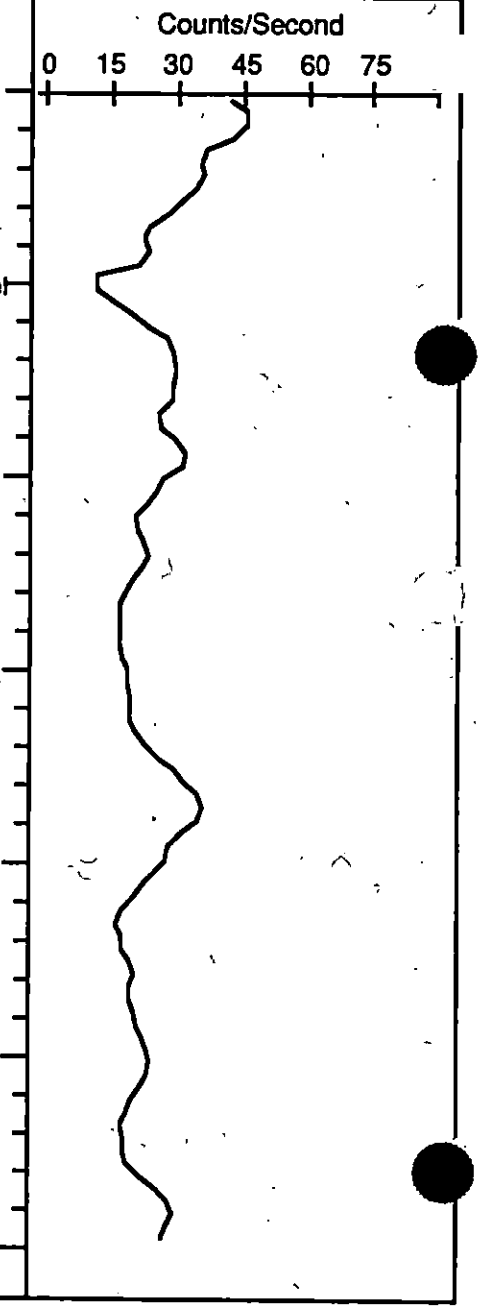
Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-2
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 1 Nov. 1993	Date Completed: 3 Nov. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 74	Ground Surface Elevation: 25.48	Inner Casing:	
Initial GW Level: ≈7 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description
30		ML				
35	X		2,4,5,7			35 - 69: Tan-orange medium sand, trace gravel
40						
45	X		7,9,12,7 No Rec.			
50						
55	X		12,14,7,9			
60						

Note: GT = Geotechnical Sample

Geophysical Gamma Log



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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-2
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 1 Nov. 1993	Date Completed: 3 Nov. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 74	Ground Surface Elevation: 25.48	Inner Casing:	
Initial GW Level: ≈7 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Geophysical Gamma Log
60						Counts/Second 0 15 30 45 60 75 90
65						
70					69: Red clay	
75					End of Boring	

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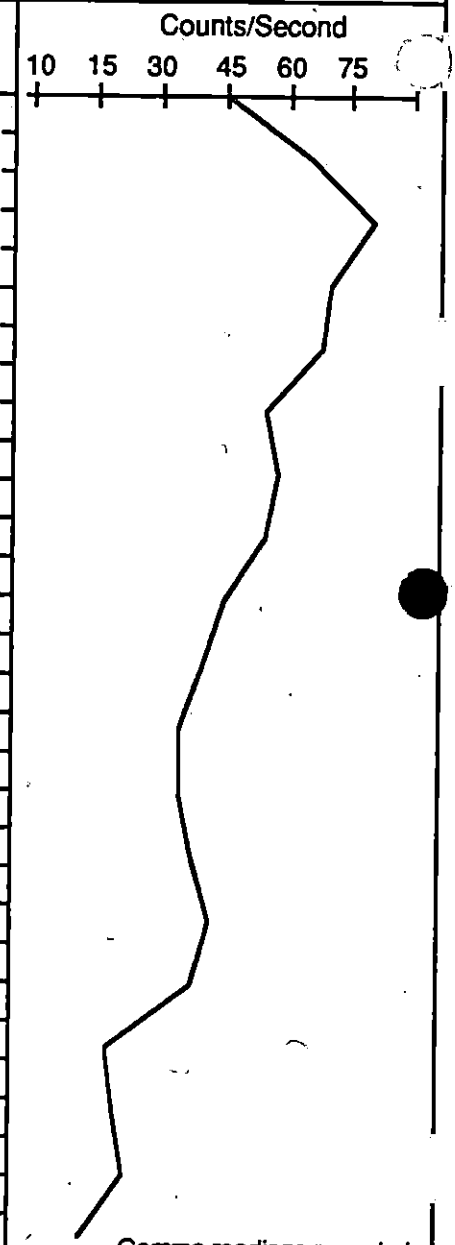
Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-3
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 21 Oct. 1993	Date Completed: 21 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 70	Ground Surface Elevation: 25.13	Inner Casing:	
Initial GW Level: 20 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description
0			9,7,9,10			0 - 0.4: Top soil 0.4 - 4.5: Brown sandy silt, trace silt
			8,5,6,6			
5			4,5,7,8			4.5 - 6.5: Gray silt, some gravel
		SM	4,5,7,9			6.5 - 8: Fine sand, some gravel
			5,5,7,11	10		8 - 8.5: Gray clayey silt 8.5 - 9.5: Brown clayey silt
10			7,6,7,9			9.5 - 12: Very fine sand, iron banding
15		SP-SM	9,10,12,14			15 - 17: Fine sand, some gravel, iron banding
20			4,5,8,12			20 - 22: Fine to medium sand, wet. Water Table
25						
30						

Note:
GT = Geotechnical Sample

Geophysical Gamma Log



Gamma readings recorded mannually every 1.5 feet

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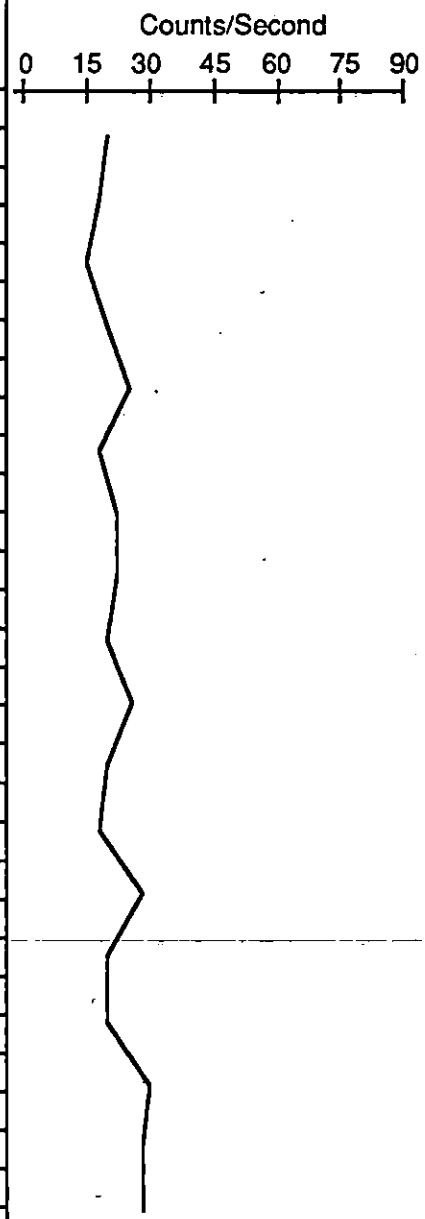
Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-3
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 21 Oct. 1993	Date Completed: 21 Oct. 1993	Screen: NA	From: - To:
Logged By: Charles Salomon	Checked By:	Pack:	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 70	Ground Surface Elevation: 25.13	Inner Casing:	
Initial GW Level: 20 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description
30	X		2,2,3,4			30 - 32: Very fine sand grading into a medium to coarse sand. Clay lens at 32
35						
40	X	SM	5,7,9,9			40 - 65: Medium to coarse silty sand
45						
50	X		9,10,7,8			
55						
60						Note: GT = Geotechnical Sample

Geophysical Gamma Log



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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-3
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 21 Oct. 1993	Date Completed: 21 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 70	Ground Surface Elevation: 25.13	Inner Casing:	
Initial GW Level: 20 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Geophysical Gamma Log
60	X		7,7,8,11				Counts/Second 0 15 30 45 60 75
65						65: Red, dense clay	
70						End of Boring	
75							

Note:
GT = Geotechnical Sample

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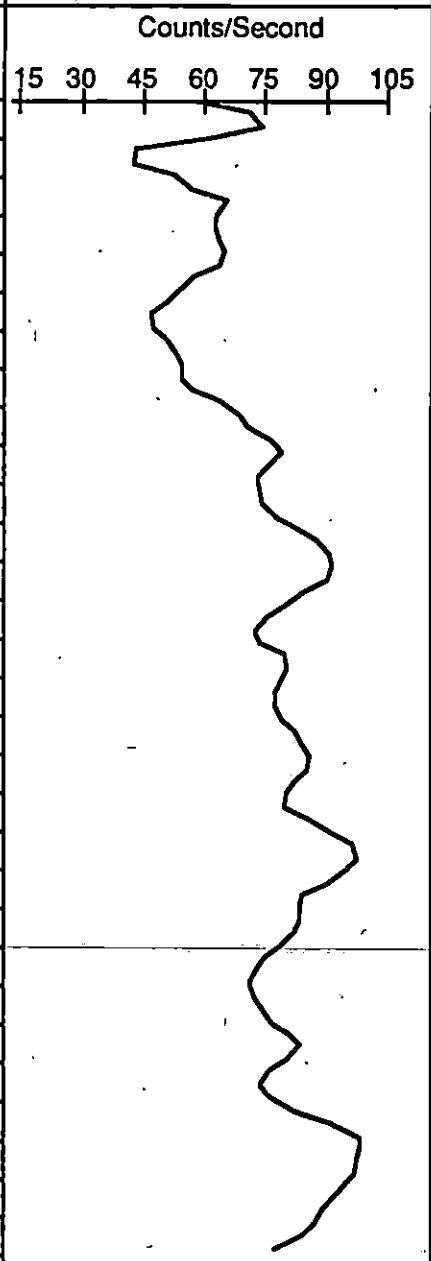
Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-4
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 25 Oct. 1993	Date Completed: 26 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 42	Ground Surface Elevation: 3.24	Inner Casing:	
Initial GW Level: 5 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description
0			2,3,3,3			0 - 0.5: Gray sandy silt
						0.5 - 2.5: Brown medium sand
			6,18,7,9			2.5 - 3.5: Gray, silty fine sand
						3.5 - 4.3: Orange-Brown medium sand
						4.3 - 5: Gray clay
5			2,1,1,1			5 - 20.5: Brown, medium sand, increasing silt and clay with depth, wet at 5 feet.
			1,1,1,1			
		SM	1,1,1,1			
10						
15						
20		ML	3,5,5,7			20.5 - 25: Gray sandy clay. Dry
25						25 - 35: Brown fine sand, trace gravel, wet
30						

Note:
GT = Geotechnical Sample

Geophysical Gamma Log



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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-4
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 25 Oct. 1993	Date Completed: 26 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 42	Ground Surface Elevation: 3.24	Inner Casing:	
Initial GW Level: 5 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Geophysical Gamma Log
30	X		10,14,16,17				Counts/Second 15 30 45 60 75 90 10
35						35 - 42: Gray silt	
40	X		3,5,7,11				
						End of Boring	
45							
50							
55							
60							

Note:
GT = Geotechnical Sample

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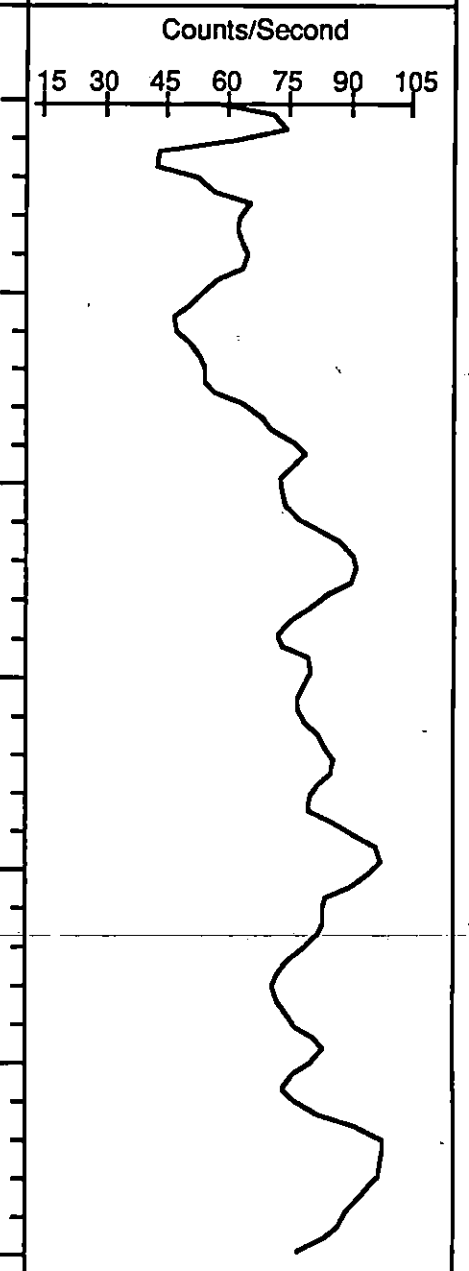
Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-4A
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 7 Nov. 1993	Date Completed: 8 Nov. 1993	Screen: NA	From: - To:
Logged By: Charles Salomon	Checked By:	Pack:	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 70	Ground Surface Elevation: 3.42	Inner Casing:	
Initial GW Level: 5 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description
0					0 - 0.5: Gray sandy silt 0.5 - 2.5: Brown medium sand 2.5 - 3.5: Gray, silty fine sand 3.5 - 4.3: Orange-Brown medium sand 4.3 - 5: Gray clay 5 - 20.5: Brown, medium sand, increasing silt and clay with depth, wet at 5 feet.
5					
10					
15					
20					20.5 - 25: Gray sandy clay. Dry
25					25 - 35: Brown fine sand, trace gravel, wet
30					

Geophysical Gamma Log



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855 Springdale Drive
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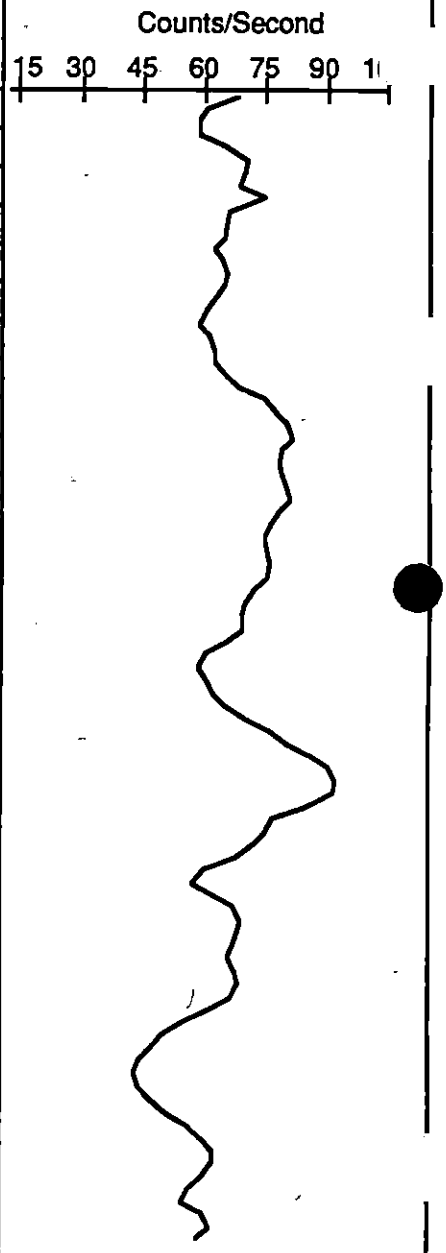
Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-4A
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 7 Nov. 1993	Date Completed: 8 Nov. 1993	Screen: NA	From: - To:
Logged By: Charles Salomon	Checked By:	Pack:	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 70	Ground Surface Elevation: 3.42	Inner Casing:	
Initial GW Level: 5 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Spit Spoon OVA (ppm)	Lithology	Description
30						
35						35 - 45: Gray silt
40						
45						45 - 52: Gray peaty silt
50	X	SM	2,2,3,3			
55						52 - 58: Geophysical log indicates a sand layer at this interval
60						58 - 65: Gray peaty silt

Note:
GT = Geotechnical Sample

Geophysical Gamma Log



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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-4A
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 7 Nov. 1993	Date Completed: 8 Nov. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 70	Ground Surface Elevation: 3.42	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Geophysical Gamma Log
60						Counts/Second 15 30 45 60 75 90 105
65					65 - 70: Red Clay	
70	X				End of Boring	
75						

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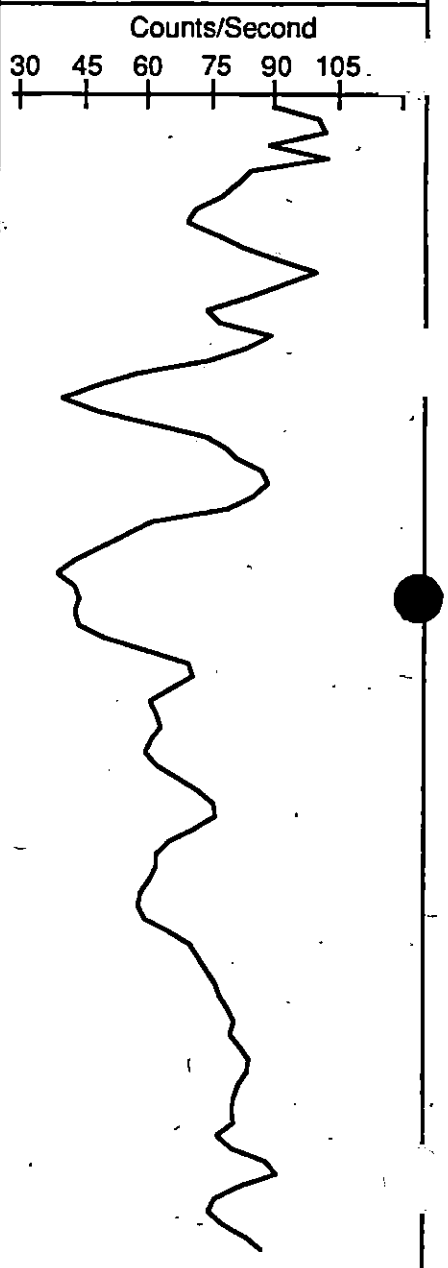
Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-5
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 27 Oct. 1993	Date Completed: 28 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 67	Ground Surface Elevation: 10.03	Inner Casing:	
Initial GW Level: 7 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Description
0		CL	3,4,4,6	0 - 1: Brown silty top soil 1 - 2: Gravelly silt 2 - 4.3: Mottled red and gray clay interbedded with tan, silty sand.
		ML	2,3,4,5	
5			5,6,6,10	4.3 - 6.4: Brown organic silt
		ML	6,5,4,4	6.4 - 18: Very fine sandy silt, wet at 7 feet
			1,1,1,1	
10			1,1,1,1	
15				18 - 21.3: Peat
20		ML	2,2,3,2	21.3 - 30: Light gray clayey silt
25				
30				

Note:
GT = Geotechnical Sample

Geophysical Gamma Log



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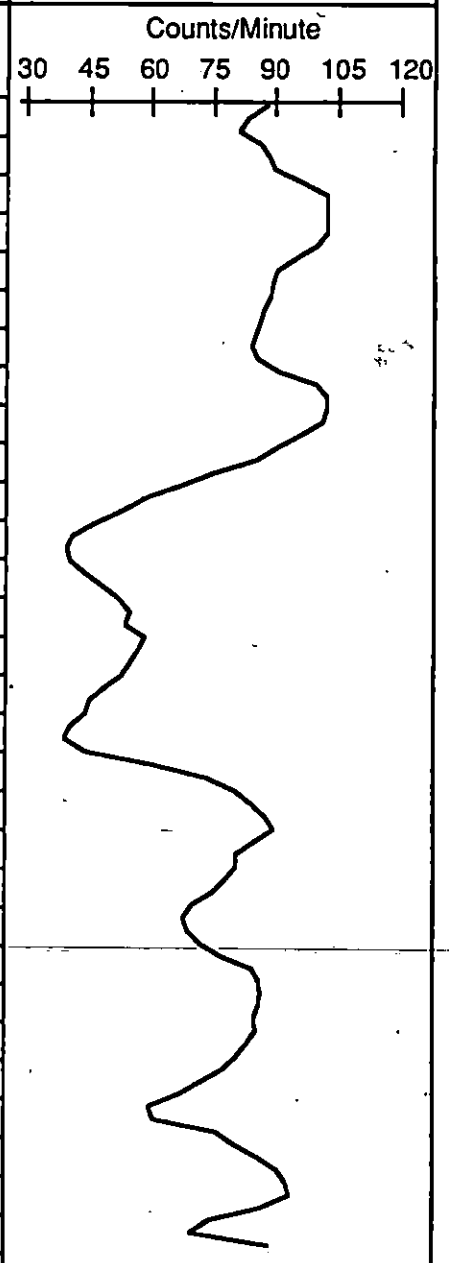
Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-5
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 27 Oct. 1993	Date Completed: 28 Oct. 1993	Screen: 0.010 Slot PVC	From: - To:
Logged By: Charles Salomon	Checked By:	Pack:	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal: NA	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 67	Ground Surface Elevation: 10.03	Inner Casing:	
Initial GW Level: 7 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description
30			5,5,7,9			30 - 45: Dark gray very fine sandy silt
35						
40		SM	3,6,5,6			
45						45 - 60: Gray, silty fine sand, silt decreases with depth
50		SC	5,7,6,11			
55			12,13,21,23			
60						

Note:
GT = Geotechnical Sample

Geophyscal Gamma Log



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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-5
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 27 Oct. 1993	Date Completed: 28 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 67	Ground Surface Elevation: 10.03	Inner Casing:	
Initial GW Level: 7 feet	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Geophysical Gamma Log
60						60 - 67: Gray, dense clay, some red clay	
65	X	CL	14,16,20,20				
						End of Boring	
70							
75							

Note:
GT = Geotechnical Sample

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-6
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 11 Nov. 1993	Date Completed: 11 Nov. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 22	Ground Surface Elevation: 58.41	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0		ML	12,13,16,21			0 - 0.5: Top soil 0.5 - 1.5: Gray silt 1.5 - 4: Orange-brown sandy silt	0	
			23,22,24,19					
5		SM	27,38,42,38			4 - 6.5: Orange-brown very fine sand	5	
			42,38,40,30			6.5 - 9: Tan very fine sand		
			31,43,28,21			9 - 22: Tan medium sand		
10			21,32,28,21				10	
15		SW-SM	28,30,32,37				15	
20			21,27,31,38 No Rec.				20	
						End of Boring		
25							25	
30							30	

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-7
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 21 Oct. 1993	Date Completed: 21 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 22	Ground Surface Elevation: 18.87	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0		ML	12,14,18,23			0 - 5.3: Brown silt, some sand, trace gravel	0	
			8,21,26,25					
5			10,14,15,15			5.3 - 6: Silty fine sand	5	
			19,21,23,18			6 - 7.3: Brown silt 7.3 - 8.5: Fine sand		
			10,16,18,29			8.5 - 19: Clayey silt, trace sand		
10		ML	12,18,17,21				10	
15			7,11,15,12				15	
20		SW-SC	5,7,8,11			19 - 22: Medium sand, trace gravel, water at approximately 18 feet	20	
						End of Boring		
25							25	
30							30	

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-8
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 20 Oct. 1993	Date Completed: 20 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 22	Ground Surface Elevation: 23.75	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0		ML	8,11,16,20			0 - 0.5: Brown silty top soil 0.5 - 5.5: Medium silty sand some gravel Perched water 5 to 5.5 feet	0	
			11,13,12,17					
5			2,3,9,9			5.5 - 6: Gray silty clay 6 - 7: Medium silty sand, trace gravel, saturated 7 - 13: Clayey silt, trace sand, dry	5	
			8,7,9,11					
			9,13,10,12					
10		ML	5,5,7,12				10	
						13 - 16.2: Silty sand		
15			10,13,15,9			16.2 - 22: Gray silty clay	15	
20		ML	2,3,2,2				20	
						End of Boring		
25							25	
30							30	

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: SB-9
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 20 Oct. 1993	Date Completed: 20 Oct. 1993	Screen:	From: - To:
Logged By: Charles Salomon	Checked By:	Pack: NA	From: - To:
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal:	From: - To:
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout:	From: - To:
Boring Depth: 22	Ground Surface Elevation: 26.30	Inner Casing:	
Initial GW Level:	GW Level: Time/Date	Outer Casing/Stick Up:	

Depth	Sample	GT Samp. Class.	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0						0 - 4: Brown medium sand, some silt, trace gravel		
		SC	33,22,15,18					
						4 - 4.7: Fine, well sorted sand		
5		ML	14,12,13,18	25		4.7 - 5.7: Clayey silt 5.7 - 6.3: Silty medium sand		
						6.3 - 7.1: clayey silt		
			15,20,19,18	8		7.1 - 8.2: Silty medium sand, trace gravel		
			12,14,16,20			8.2 - 10: Clayey silt		
10		CL	6,7,12,18			10 - 10.5: Silty sand 10.5 - 14: Clayey silt		
						14 - 21: Gray clay		
15		ML	2,3,5,5	200 - 700				
20		SM	4,6,6,8			21 - 22: Brown silt, some sand, water at 21.5		
						End of Boring		
25								
30								

WELL CONSTRUCTION SUMMARY
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/05/94

WELL	SWMU LOCATION	CONSTRUCTION MATERIAL	CASING DIAMETER (INCHES)	NORTH	EAST	WELL DEPTH (FT.)	SURFACE ELEVATION	TOP OF CASING ELEVATION
114	WASTE LAKE 1	PVC	4.000	583618.2578	442128.3461	13.00	4.53	6.11
A-08	NBSL	PVC	4.000	582266.4191	441992.7368	19.00	19.06	22.08
A-11A	NBSL	PVC	4.000	582564.5078	441304.9969	54.00	26.00	28.43
A-12	NBSL	PVC	4.000	582256.8822	441360.9554	29.00	24.15	24.97
A-13	NBSL	PVC	4.000	581987.4305	441477.6612	56.00	17.60	20.59
A-14	NBSL	PVC	4.000	582295.7741	441887.5534	21.00	17.13	19.74
A-15	NBSL	PVC	4.000	582432.6221	441757.9952	49.00	14.58	17.54
A-16	NBSL	PVC	4.000	582543.1698	441495.8626	65.00	23.89	25.58
A-18	WASTE LAKE 3	PVC	4.000	583058.4091	441504.8286	65.00	24.00	25.50
A-20	WASTE LAKE 1	PVC	4.000	583742.4104	442273.4630	57.50	6.40	8.43
A-23	NBSL	PVC	4.000	582426.7859	441762.6042	25.00	14.71	17.48
A-24	NBSL	PVC	4.000	582543.1700	441487.4830	48.00	23.98	26.52
A-25D	WASTE LAKE 1	PVC	4.000	583358.3544	441934.6944	52.00	17.87	20.28
A-25S	WASTE LAKE 1	PVC	4.000	583361.9594	441940.9770	36.00	17.87	19.83
A-26 OB	OBSL	PVC	4.000	582861.6317	441577.9779	18.00	25.34	27.35
A-26D	OBSL	PVC	4.000	582858.7215	441572.9062	69.00	25.48	27.42
A-26S	OBSL	PVC	4.000	582856.0578	441577.5078	45.00	25.59	27.59
A-27D	CHEM-FIX UNIT	PVC	4.000	583377.4542	441990.7000	65.00	22.97	25.13
A-27S	CHEM-FIX UNIT	PVC	4.000	583384.3118	440992.3695	30.00	22.90	25.48
A-29 OB	WASTE LAKE 2	PVC	4.000	584503.0954	443057.6182	20.00	2.60	4.98
A-29D	WASTE LAKE 2	PVC	4.000	584490.6459	443071.6365	60.00	3.42	4.84
A-29S	WASTE LAKE 2	PVC	4.000	584502.1699	443081.2888	35.00	3.24	5.71
A-30 OB	WASTE LAKE 2	PVC	4.000	584191.8889	444152.4927	18.00	7.88	9.87
A-30D	WASTE LAKE 2	PVC	4.000	584199.8085	444145.7624	60.00	7.51	10.03
A-6A	NBSL	PVC	4.000	581991.5495	441917.6308	19.50	20.44	22.22
A-7A	NBSL	PVC	4.000	581983.4374	441501.4213	19.50	17.84	19.87
B-05	OBSL	PVC	4.000	582778.1369	441987.7494	29.00	17.09	19.28
R-110	WASTE LAKE 1	PVC	4.000	583210.3174	442096.4095	35.50	16.39	18.38
R-112	WASTE LAKE 3	PVC	4.000	583151.6824	441658.5334	35.00	22.33	24.75
STAR-18D	UPGRADIENT	PVC	4.000	581776.6303	441580.0843	75.00	.00	1.00
STAR-18S	UPGRADIENT	PVC	4.000	581776.2442	441571.8782	36.00	.00	1.00

WELL CONSTRUCTION SUMMARY
OCCIDENTAL CHEMICAL CORPORATION
DELAWARE CITY, DELAWARE
REPORT DATE 05/05/94

WELL	SCREENED LITHOLOGY	SCREEN TOP ELEV. (FT.)	SCREEN BOTTOM ELEV. (FT.)
114	UPPER COLUMBIA	9.00	12.00
A-08	UPPER COLUMBIA	9.00	19.00
A-11A	LOWER COLUMBIA	44.00	54.00
A-12	UPPER COLUMBIA	19.00	29.00
A-13	LOWER COLUMBIA	46.00	56.00
A-14	UPPER COLUMBIA	11.00	21.00
A-15	LOWER COLUMBIA	39.00	49.00
A-16	LOWER COLUMBIA	53.00	63.00
A-18	LOWER COLUMBIA	53.00	63.00
A-20	LOWER COLUMBIA	45.00	55.00
A-23	UPPER COLUMBIA	.00	.00
A-24	UPPER COLUMBIA	.00	.00
A-25D	LOWER COLUMBIA	42.00	52.00
A-25S	UPPER COLUMBIA	26.00	36.00
A-26 OB	SURFACE DEPOSITS	8.00	18.00
A-26D	LOWER COLUMBIA	59.00	69.00
A-26S	UPPER COLUMBIA	35.00	45.00
A-27D	LOWER COLUMBIA	55.00	65.00
A-27S	UPPER COLUMBIA	20.00	30.00
A-29 OB	SURFACE DEPOSITS	10.00	20.00
A-29D	MAGOTHY	50.00	60.00
A-29S	COLUMBIA	25.00	35.00
A-30 OB	SURFACE DEPOSITS	8.00	18.00
A-30D	MAGOTHY	45.00	60.00
A-6A	UPPER COLUMBIA	9.50	19.50
A-7A	UPPER COLUMBIA	9.50	19.50
B-05	UPPER COLUMBIA	19.00	29.00
R-110	UPPER COLUMBIA	30.50	35.50
R-112	UPPER COLUMBIA	30.00	35.00
STAR-18D	LOWER COLUMBIA	63.00	73.00
STAR-18S	UPPER COLUMBIA	14.00	34.00

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: A-25D
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 28 Oct. 1993	Date Completed: 29 Oct. 1993	Screen: 0.010 Slot PVC	From: 42 - To: 52
Logged By: Charles Salomon	Checked By:	Pack: #1 Morie Sand	From: 40 - To: 52
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal: Bentonite Pellets	From: 38 - To: 40
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout: Cement/Bentonite	From: 0 - To: 38
Boring Depth: 57	Ground Surface Elevation: 17.87	Inner Casing: 4 inch ID, Sch. 40 PVC	
Initial GW Level: ≈25 feet	GW Level: 16.18 Date: 12/13/93	Top of Casing Elevation: 20.28	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0		18,31,39,50			0 - 1: Gravel mixed with top soil 1 - 2: Brown silt 2 - 4: Tan very fine, silty sand		
		12,13,17,23					
5		17,33,21,28			4 - 6: Tan-orange sandy silt. Grades to a fine sand. 6 - 8: Tan-orange fine to medium sand interbeded with clay		
		15,13,15,30	0.4				
		7,10,14,11			8 - 15: Tan-orange clay		
10		5,6,6,7	37				
15					15 - 28: Fine silty sand		
20		6,7,6,6	>1000				
25					28 - 31.3: Tan sandy silt		
30							

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: A-25D
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 28 Oct. 1993	Date Completed: 29 Oct. 1993	Screen: 0.010 Slot PVC	From: 42 - To: 52
Logged By: Charles Salomon	Checked By:	Pack: #1 Morie Sand	From: 40 - To: 52
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal: Bentonite Pellets	From: 38 - To: 40
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout: Cement/Bentonite	From: 0 - To: 38
Boring Depth: 57	Ground Surface Elevation:	Inner Casing: 4 inch ID, Sch. 40 PVC	
Initial GW Level: ≈25 feet	GW Level: 16.18 Date: 12/13/93	Top of Casing Elevation: 20.28	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
30		6,7,6,6			31.3 - 35: Gray fine silty sand		
35					35 - 55: Tan-orange medium sand, trace gravel		
40		3,6,12,18					
45							
50		No Rec.			53 - 57: Gray dense clay		
55		3,7,5,6			End of Boring		
60							

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: A-25S
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 8 Nov. 1993	Date Completed: 9 Nov. 1993	Screen: 0.010 Slot PVC	From: 26 - To: 36
Logged By: Charles Salomon	Checked By:	Pack: #1 Morie Sand	From: 24 - To: 36
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal: Bentonite Pellets	From: 22 - To: 24
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout: Cement/Bentonite	From: 0 - To: 22
Boring Depth: 36	Ground Surface Elevation: 17.87	Inner Casing: 4 inch ID, Sch. 40 PVC	
Initial GW Level: ≈25 feet	GW Level: 15.77 Date: 12/13/93	Top of Casing Elevation: 19.83	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
0					0 - 1: Gravel mixed with top soil 1 - 2: Brown silt 2 - 4: Tan very fine, silty sand		
5					4 - 6: Tan-orange sandy silt. Grades to a fine sand. 6 - 8: Tan-orange fine to medium sand interbedded with clay 8 - 15: Tan-orange clay		
10							
15					15 - 28: Fine silty sand		
20							
25					28 - 31.3: Tan sandy silt		
30							

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Client: Occidental Chemical Corporation		WO#: 72209.00.01	Boring/Well: A-25S
Project: Phase I RCRA Facility Investigation		Well Construction Data	
Date Started: 8 Nov. 1993	Date Completed: 9 Nov. 1993	Screen: 0.010 Slot PVC	From: 26 - To: 36
Logged By: Charles Salomon	Checked By:	Pack: #1 Morie Sand	From: 24 - To: 36
Drilling Co.: ADT	Driller: Jeff Jaworski	Seal: Bentonite Pellets	From: 22 - To: 24
Method: Hollow-Stem Auger	Equipment: Mobile B-61	Grout: Cement/Bentonite	From: 0 - To: 22
Boring Depth: 36	Ground Surface Elevation: 17.87	Inner Casing: 4 inch ID, Sch. 40 PVC	
Initial GW Level: ≈25 feet	GW Level: 15.77 Date: 12/13/93	Top of Casing Elevation: 19.83	

Depth	Sample	Blow Count Rec./RQD	Split Spoon OVA (ppm)	Lithology	Description	Remarks	Well Construction
30					30 - 31.3: Tan sandy silt 31.3 - 32: Gray fine silty sand		
35					End of Boring		
40							
45							
50							
55							
60							